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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 71- 503

RICHARD T. WHITCOMB, *Petitioner,*

v.

GENERAL DYNAMICS CORPORATION AND AMERICAN AIRLINES, INC., *Respondents.*

APPENDIX TO PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FOURTH CIRCUIT

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October 8, 1971

PRESS OF BYRON S. ADAMS PRINTING, INC., WASHINGTON, D. C.

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APPENDIX

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
NEWPORT NEWS DIVISION

CIVIL ACTION No. 1174

RICHARD T. WHITCOMB, *Plaintiff*,

v.

AMERICAN AIRLINES, INC., *Defendant*.

and

CIVIL ACTION No. 1133

GENERAL DYNAMICS CORPORATION, *Plaintiff*,

v.

RICHARD T. WHITCOMB, *Defendant*.

Memorandum

Before even attempting the unwinding of this complicated combination of patent law and aerodynamics, the record is to reflect the gratitude of this Court to the very, very competent attorneys, Carl G. Love, Esquire, for the plaintiff, and Davidson C. Miller, Esquire, for the defendant. To try this long case before a judge, admittedly a novice in patent litigation and transonic aerodynamics, has posed a problem to these gentlemen of the bar which they have overcome graciously with great patience. While the conclusion of the matter has thus not been made easy in resolution, it, nevertheless, has been an orderly accomplishment.

The controversy in litigation arises over the use of General Dynamics of certain bodies attached to the wings of its Convair 990 and 990A aircraft, variously designated as "anti-shock bodies" or "speed capsules." These aircraft, with the anti-shock bodies on the wings thereof, were pur-

chased and operated by American Airlines as the "990 Astrojet."

Whitcomb claims, and General Dynamics and American Airlines deny, that the 990 aircraft with such anti-shock bodies constitute infringement of a patent held by Whitcomb. In addition to denying infringement, General Dynamics and American Airlines also assert that the patent, for various reasons, is invalid.

Suffering, perhaps, in the brevity of this description, the invention may be described as a cylindrical body, pointed at either end, attached to the upper surface of the wing of a transport type aircraft, in a position parallel to the fuselage, which attachment, when the aircraft is traveling at high subsonic speeds, just below the speed of sound, will serve as a means to control boundary layer separation, with the practical effect of increasing the speed of the aircraft—in this case, 10-12 knots.

It is alleged that by the addition of the Whitcomb invention, General Dynamics was able to meet the speed requisite required in its contract with American Airlines and to thus perfect the sale of a number of 990 aircraft.

Richard T. Whitcomb instituted his civil action against American Airlines, Inc. for patent infringement in the Alexandria Division of this District. About the same time, General Dynamics Corporation filed its suit against Richard T. Whitcomb for declaratory judgment that the patent was invalid and had not been infringed, in the Newport News Division of this District. In the latter suit Whitcomb proceeded by counterclaim for patent infringement against General Dynamics.

Because of the common questions of law and fact involved, the parties agreed, and the Court concurred, that the Alexandria action should be transferred to the Newport

News Division. Following transfer, upon motion of Whitcomb, the cases were consolidated for trial. For the consolidated trial, the parties aligned themselves so that Whitcomb proceeded as plaintiff and General Dynamics and American Airlines, Inc. jointly proceeded as defendants. In fact, the defense was conducted by General Dynamics, which, pursuant to the purchase agreement for the 990 aircraft, had agreed to indemnify American Airlines, Inc. for liability, if any, arising from patent infringement.

FINDINGS OF FACT

1. U.S. Letters Patent No. 2,967,030 were granted to Richard T. Whitcomb under 35 U.S.C. § 266 on January 3, 1961, maturing from an application filed on November 13, 1957. Since January 3, 1961, Whitcomb has remained the sole owner of this patent in suit. The claims of the patent in issue in this action are claims 1, 2 and 3, which Whitcomb asserts have been infringed by the manufacture, use and sale of the Convair 990 and 990A aircraft built by General Dynamics.

2. As the speed of an airplane in relation to the atmosphere increases toward the speed of sound, certain physical phenomena begin to occur at high subsonic speeds, in excess of about Mach 0.8. The air passing over the upper surface of the wing, because it is accelerated, moves over the wing at a speed faster than the speed of the airplane itself. Thus, as the airplane flies at high subsonic speeds, just under the speed of sound, the air passing over the top of a cambered wing accelerates to a speed equal to or exceeding the speed of sound. At this point, a portion of the airflow over the curved wing enters a supersonic phase, while another portion remains subsonic. This condition of partial subsonic and partial supersonic flow is known in aerodynamics as "transonic flow."

3. A the point where the local air velocities over the wing increase to supersonic velocity, a sharp pressure change occurs and this pressure change is known both to the laymen and the aerodynamicists as a shock wave. Because of the camber or curvature of the upper surface of the wing, the sharp pressure change or shock wave, occurs just rearward of the region of maximum thickness of the wing. Behind or rearward of the shock wave, which clings to the top of the wing, the flow of air undergoes violent changes: from the smooth laminar flow forward of the shock wave, the flow behind the shock wave loses energy, and changes direction, even to the point that it may begin to flow forward, rather than rearward. This results in the condition known to the aerodynamicists as "boundary layer separation", where the air flow, under the influence of the sharp pressure changes, moves away from, or separates from, the wing surface.

4. The compressibility drag induced by boundary layer separation is severe and results, when it occurs in the higher subsonic speeds, in a sharp increase in the total drag of the airplane. This increase, in fact, is so rapid and of such magnitude that, as a practical matter, the drag more than offsets the thrust of the engines and prohibits the airplane from increasing its speed any further. In fact, the evidence indicates that the drag rise for a conventional jet aircraft rises so abruptly that even substantial increases in the airplane forward thrust would not result in any appreciable speed increase. In other words, the drag rise curve for a particular airplane is virtually a speed barrier through which the airplane may not pass.

5. Prior to 1957, it was well accepted among aerodynamicists that the addition of structure to an aircraft would result in an increase in the drag of the airplane in subsonic flight. That is, while a wing alone would add some drag, a wing and fuselage combination would add more drag, and the addition of the empennage would add

more drag, the addition of engines would add more drag, the addition of supporting struts for the engines would add yet more drag, i.e., the drag would be increased measurably by the addition of an additional body. Dr. Whitcomb's invention, to some degree, is a contradiction to the absolutes of this theory.

The Whitcomb invention, the patent, and proceedings thereon.

6. The patentee and plaintiff herein, Richard T. Whitcomb, is and has been since 1943 an aerodynamicist in the employ of the National Advisory Committee for Aeronautics and, since the title was changed in 1958, of the National Aeronautics and Space Administration, at the Langley Research Center, in Hampton, Virginia. He is well known in his field as an aerodynamicist of singular abilities who received the coveted Collier Trophy in 1955 for his discovery and development of the "area rule" theory.

7. The patent in suit relates to a concept and means for solving the problems of shock-induced boundary layer separation and related difficulties, not limited to, but including, the speed of the aircraft. The patent teaches that shock-wave induced boundary layer separation on lifting-type wings can be reduced by the addition of special elongate bodies on the upper surface of the wing, with the result that at high subsonic speeds, and the total drag on the aircraft is reduced by delaying the drag rise associated with transonic flow over the wing surfaces.

8. The Whitcomb patent discloses specifically that the boundary layer separation can be reduced or minimized by placing the specially shaped elongate bodies chordwise along the wing. Such bodies have a forward portion that gradually increases in cross-section, approximately like a cone; the bodies increase in cross-section to a maximum thickness at or near the trailing edge of the wing; and

the aft portions of the bodies extend rearward of the wing trailing edge, gradually tapering from the maximum. The patent teaches that the gradually increasing forward region of the bodies lies at or just ahead of the region of the maximum thickness of the wing so as to gradually decelerate the air velocities and to delay the transition from subsonic flow to supersonic flow, while the remaining portions gradually increase to a maximum at the trailing edge and then gradually decrease so as to alter and gradually reduce the downstream adverse pressure gradients associated with the separation of the boundary layer over the wing.

9. The Whitcomb patent discloses that although the bodies add drag to the airplane at low speeds, one of the most important practical results is that at high speeds, the Mach number at which the drag rapidly increases due to the compressibility drag is "delayed" or raised to a higher value. This means as a practical matter that an airplane with the "anti-shock" bodies can fly faster before the speed-inhibiting drag rise phenomenon occurs.

10. Prior to 1957, Dr. Whitcomb was aware of efforts being made by other researchers to solve the "boundary layer separation" problem associated with flight in the transonic range. Whitcomb had been working at home in his spare time on a solution to this problem and, over a weekend in January 1957, suddenly conceived a solution to the problem. Thereafter, he devised a means for putting his concept into practice. The following Monday Whitcomb disclosed his invention of the patent in suit to Axel T. Mattson, his supervisor at NASA, and subsequently to other co-workers at Langley Field.

11. Subsequently, tests were authorized at the Langley Field wind tunnel by Whitcomb's supervisor, using an available model, to determine the extent of the effectiveness of the bodies disclosed by Whitcomb. In May 1957, Whitcomb prepared an additional patent disclosure and requested that an application for patent be filed at government expense,

agreeing to grant the government an irrevocable, royalty-free license for governmental purpose. The disclosure and request were forwarded on May 13, 1957 by Whitcomb's supervisor to NACA Headquarters for consideration.

12. On about August 3, 1957, Whitcomb was advised for the first time that the government would file a patent application on his invention of the patent in suit.

13. On October 9, 1957, Whitcomb executed a patent application, prepared by the Office of Naval Research, describing the invention of special bodies and the opening paragraph of that application recited that the invention could be used by or for the United States Government, for governmental purposes, without the payment of any royalties. The description of the bodies was essentially the same as Whitcomb's written disclosures in February, the description being amplified by his subsequent May 13, 1957 disclosure and his August 9, 1957 letter making further changes.

14. Following the filing of Whitcomb's patent application, NACA officials determined, after consideration of the circumstances involved in the making of the invention, that Whitcomb was entitled to retain title to his patent application, subject to the irrevocable license already assigned by Whitcomb for governmental purposes. On December 19, 1957, patent representatives of NACA requested concurrence by the Government Patents Board which had final jurisdiction under Executive Order 10096. On August 12, 1958, the Chairman of the Government Patents Board addressed a letter to the Patent Liaison Officer at Langley advising him that the report and supplemental information supplied by NACA had been reviewed pursuant to Executive Order 10096, and had determined that the government was not equitably entitled to an assignment to the entire right, title and interest in and to the invention, and that, "title to the invention should be left in the inventor." This decision was communicated from NASA headquarters to Langley Field on October 29, 1958.

Publications of Whitcomb's Invention and Use of His Disclosures.

15. Based upon the results shown by his first wind tunnel tests, Dr. Whitcomb began preparation of a Research Memorandum to be published by NACA disclosing the usefulness of the invention. Prior to the publication of that Memorandum, in early July 1957, Whitcomb was instructed by his superiors to give an interview to an "Aviation Week" editor to discuss for publication the results of his invention.

16. On July 24, an invitation was also sent out by the Director of NACA to representatives of the military and certain aircraft manufacturers to send representatives to visit Whitcomb to discuss his invention, prior to the general publication of his memorandum. Whitcomb was ordered to disclose his invention to these representatives.

Whitcomb was then visited by representatives from the Air Force, who were interested in improving the performance of military airplanes, and by representatives of the various airframe manufacturers, including Lockheed, McDonnell, Boeing, General Dynamics and Douglas Aircraft.

The *first* such visitor was James G. Wenzel from the Convair division of General Dynamics who met and talked with Dr. Whitcomb on July 30, 1957.

17. At the meeting between Whitcomb and Wenzel, it seems to be agreed that Whitcomb did describe his concept to Wenzel, showed him the data about to be published, and permitted him to trace or copy some of the data. While Wenzel claims that the discussion included the mention of Convair's commercial 880 jet transport program and that Whitcomb was "disappointed" that industry had shown no interest in using his invention of the special bodies, doubt is cast on this version of events by Whitcomb's denial of such discussions, and by the fact, supported by contemporaneous documentation, that Wenzel was the very *first*

person from industry to contact or talk to Whitcomb about his invention. Thus, Whitcomb could not possibly have been "disappointed" because at that time no one else had seen him and the industry did not yet even know about his discovery.

18. After his conference with Whitcomb, Wenzel returned to Convair, San Diego, prepared and distributed copies of his trip report of the meeting, including the data he had copied from Whitcomb's memorandum drafts. To the aerodynamicists at Convair, who had previously been searching for a way of reducing drag rise and obtaining a higher speed, the Whitcomb disclosures were regarded as "an important milestone." Although skeptical at first, they later saw that Whitcomb's data revealed that the drag could be delayed to a higher Mach number, and realized that this represented the "breakthrough" they had been seeking.

19. Immediately after receipt of Whitcomb's disclosures, on August 14, 1957, Convair ordered models to be made for wind tunnel testing of bodies identical to those shown and described in Whitcomb Research Memorandum. A series of tests, on December 10-13, 1957, were completed so that Convair could determine the effects of the bodies on the drag of its jet transport under development. These tests were exhaustive and included data on the effects of the bodies at various speeds (Mach numbers) and at various lift coefficients. The tests results clearly showed Convair that at high subsonic speeds, the bodies delayed the drag rise and had a favorable effect on the speed of the airplane.

20. Whitcomb was next contacted by a Convair representative when he was consulted in early January 1959 by Mr. George Grogan, of the Fort Worth Division of Convair about the B-58 "Hustler" bomber design. During their conversation at Langley Field on January 9, 1959, Whitcomb told Mr. Grogan, an old acquaintance, of his pending

patent application on the anti-shock bodies. Whitcomb invited Grogan to convey this information about his application and the fact that he had title to the application to Convair officials at San Diego where the transport was to be built. Grogan indicated that he would, and this information was communicated to such Convair officials at San Diego almost immediately.

21. On January 5, 1961, Convair was notified by the Manufacturers Aircraft Association of the issuance of Whitcomb's patent in suit. This notification triggered further activity by Convair patent department, which obtained a "file history" of Whitcomb's patent and started a further and even more extensive validity search for further prior patents and publications. In addition, the patent department held many extensive interviews with the engineers and aerodynamicists working on the 990 program to obtain statements from them regarding Whitcomb's patent and the history of the anti-shock bodies. All of this material was added to the growing "Whitcomb File" which was being kept by Convair. At about this time, the word was passed around at Convair that no one should contact Whitcomb about his patent.

22. In January 1962, Convair patent personnel had further interviews with persons in the Engineering Department regarding contacts with Whitcomb. The opinion was recorded that General Dynamics' "present approach" to the matter appeared to be correct. In February 1962, Whitcomb made an unusual trip to San Diego, at the urgent request of Convair, to help them solve certain problems unrelated to the anti-shock bodies, and while there he saw the 990 aircraft for the first time and observed the shaping and location of the bodies on the wing. Following that visit, Whitcomb returned to Langley Field and, shortly thereafter, contacted patent attorneys to ascertain whether the airplane infringed the patent in suit. After consultations with counsel, notice that the 990 was considered an

infringement of Whitcomb's patent was mailed to General Dynamics in May 1962.

23. During the entire period from January 1959, when it first learned of Whitcomb's patent application on the speed bodies, through to 1962, when the 990 airplane was completed, General Dynamics never advised Whitcomb personally of its intention to use his invention in its commercial jet transports, nor did it seek permission or license from Whitcomb to use the invention. It was well known to General Dynamics that NACA allowed its employees to retain private patent rights, and there is no evidence to suggest that at any time during that period did General Dynamics have any belief that it did *not* need a license, or that it already had a license to practice Whitcomb's invention.

General Dynamics' Contract with American Airlines, Inc.

24. In the winter of 1957-1958, the Convair division of General Dynamics opened negotiations with American Airlines for the purchase of a more advanced jet transport which would prove superior in performance to the existing designs by Boeing and Douglas. It was the specific aim of American Airlines to acquire a faster airplane and the speed guarantees were at all times an important part of the negotiations. Very early in the negotiations, General Dynamics proposed the use of anti-shock bodies, based upon Convair's tests of Whitcomb's bodies, to provide the speed increase demand by American Airlines. Convair Report ZD-22-005, a specification dated January 27, 1958, contained a specification for anti-shock bodies to be mounted on the wings to inhibit the formation of shock waves at high speeds. The illustrations of the airplane in this report show one outboard anti-shock body on each wing of the airplane. Throughout this time period, publications of General Dynamics and American Airlines continually

wrote glowingly to the public of the results of the use of the shock bodies and the benefit thereof to air travelers.

25. On July 1, 1958, Convair Division of General Dynamics and American Airlines entered into an agreement for the purchase of twenty-five (25) aircraft. The specifications called for a guarantee maximum cruise speed of 543 knots, plus or minus 2%.

26. On July 1, 1958, the design of the anti-shock bodies for the airplane was not yet final. The design for the anti-shock bodies was completed in December 1958 and the production drawings for the airplane were released in September 1959.

27. After construction of the 990 airplanes by Convair in 1961, it became apparent that the designs of several portions of the aircraft, principally in the engine nacelle pod-plyon arrangement, were faulty and substantially increased the drag of the airplane, thus reducing the speed of the airplane below that guaranteed to American Airlines.

28. In 1961, American Airlines canceled the Purchase Agreement, because of the non-delivery of aircraft according to the contract guarantees. Subsequent to the cancellation, negotiations reopened, looking toward a new contract. The tenor of subsequent negotiations is best shown by Whitcomb Exhibit 95, a memorandum by the Chairman of American Airlines, covering a meeting of the top management of both companies. The memorandum shows that the cruising speed of the 990 was a prime concern of American Airlines, and that if General Dynamics could not guarantee a cruising speed of at least 530 knots, there would be no sale.

29. A new contract for the purchase of the 990 by American Airlines was made in September 1961. American's concern about the cruise speed of the aircraft was reflected in specific contract provisions whereby American would

place into escrow $500,000 of the purchase price of each aircraft, with increments of this amount to be made to Convair as an additional payment, depending upon the cruising speed eventually demonstrated. If the speed demonstrated by Convair was 545 knots, Convair would receive the entire additional $500,000 per airplane, but if the demonstated speeds were less than 535 knots, American could refuse to accept the airplanes.

30. Pursuant to this renegotiated contract, General Dynamics ultimately demonstrated in 1962 a cruising speed of 542 knots for the 990 aircraft and delivered the airplane to American, receiving an additional payment of $400,000 per airplane from American Airlines.

Infringement of Whitcomb's Patent by General Dynamics

31. Each of the 990 of 990A airplanes manufactured by General Dynamics has bodies on the wings which have been designated "anti-shock bodies" and "speed capsules" in various documents and publication[s] originated by American Airlines and General Dynamics. The "anti-shock bodies" or "speed capsules" are substantially identical in configuration on all versions of the 990 and 990A.

32. Each of the Convair 990 and 990A aircraft manufactured by General Dynamics is an airplane having a fuselage and a wing panel extending from each side of the fuselage. The outboard "anti-shock body" or "speed capsule" on each wing panel of the 990 and 990A is an elongate body on the upper surface of the wing panel extending generally chordwise of the wing panel. Each outboard anti-shock body has a forward region of a progressively increasing cross-sectional area approximately the same as that of a cone extending just forward of the wing panel region of maximum thicknes. Each outboard anti-shock body further has a region of maximum cross-section near

the wing panel trailing edge. Each outboard anti-shock body also has a rear tapered portion extending aft of the wing panel trailing edge.

33. Each of the bodies referred to in Finding 32 has a straight axis extending in the flight direction, and also has a circular cross-section. Thus, each outboard anti-shock body corresponds to each feature of claims 1, 2 and 3 of the Whitcomb patent in suit.

34. The anti-shock bodies on the 990 and 990A aircraft were primarily intended by General Dynamics to perform the aerodynamic function of reducing drag of the airplane at high subsonic speeds. The anti-shock bodies were intended by General Dynamics to straighten the air flow over the wing at high speeds, and thus to delay the formation of shock waves over the wing which induce boundary layer separation. The purpose of the anti-shock bodies on the Convair 990 and 990A aircraft is substantially the same as the teachings of the Whitcomb patent in suit. Although the anti-shock bodies also carried fuel, this was only a secondary purpose, and they remained on the airplane as effective aerodynamic anti-shock bodies.

35. The anti-shock bodies on the wings of the Convair 990 and 990A aircraft have a beneficial effect on the drag of the airplane at high subsonic speeds and contribute an increase of at least 10-12 knots to its cruising speed.

Prior art, patents and publications.

Originally, defendant, General Dynamics, had indicated nearly 100 items of "prior art" considered by them between January, 1959 and March, 1968. Only about fifty (50) of these were considered relevant enough to include in the required Notice of Statutory Prior Art filed before trial. Actually, evidence was only presented to fifteen (15) of these items identified as the Küchemann reports (General Dynamics Exhibits 21-25, 40); Russian airplane, TU-104

(General Dynamics Exhibits 49-51); the Hütter "Dopplereiter" report (General Dynamics Exhibits 52 and 52A); 2 U.S. patents (General Dynamics Exhibits 42 and 44); a German patent (General Dynamics Exhibit 42); and 4 NACA Research Memoranda (General Dynamics Exhibits 45-48). Each of these will be commented on separately.

36. Beehereau U.S. Patent 2,074,201, issued in 1937 (General Dynamics Exhibit 42), was recognized as early as April of 1959, by General Dynamics' Patent Department, as having "no relation to Whitcomb's work." This patent refers only to some "bulges" generally attached to the very trailing edge of the wing, to control, according to General Dynamics' witness, Dr. Goethert, an "eddying flow of air" at low speeds, in contrast to the high speed transonic region of flight contemplated in the Whitcomb patent. This reference is not aerodynamically related to the concept developed by Dr. Whitcomb.

37. The Hertel et al., German Patent 932,410, of 1944 (General Dynamics Exhibit 43), bears no relationship to the invention of the Whitcomb patent in suit. It is directed to another patent of Dr. Whitcomb's, "the area rule," not in suit. It was admitted by General Dynamics' expert at trial (Dr. Goethert) that he could find no structure disclosed in this patent which showed a body mounted on the upper surface of an airplane wing with the features characterized by the claims here in suit. This "prior art" patent bears no possible relationship to the "speed body" or "anti-shock body" invention of the patent in suit. Further, there is no evidence that any of the airplanes disclosed in this patent, if built, would actually accomplish the drag reduction objectives of the Whitcomb patent.

38. The Smith U.S. Patent 2,950,879 (General Dynamics Exhibit 44), is directed to a development applicable for *supersonic* flight conditions, rather than transonic flight conditions, and seeks to improve the lifting characteristics

of the air foil, rather than a reduction in the drag characteristics of the airplane. In fact, Dr. Goethert said he would have to "turn the wing over" to find any similarity in the Smith patent and he further admitted that the bodies shown in the Smith patent were "obviously" to aid in control of aileron surfaces, and are distinctly different in nature and in location on the wing from the bodies described in the claims of the Whitcomb patent here in suit. This prior art reference is not aerodynamically related to the concept developed by Dr. Whitcomb.

39. A report authored by Silvers and Spreeman, NACA RM L7K20, dated in 1948 (General Dynamics Exhibit 45), was concerned with an entirely different problem of "interference" between the *lower* surface of the wing and the adjacent fuselage; prescribed bodies, *under* the wing, having a shape quite different from those required by the claims of Whitcomb's patent in suit, and states that such bodies should be located at a different position from that prescribed by Dr. Whitcomb, with "very little" effect on air flow above the wing (Dr. Goethert).

40. The NACA Report authored by Hanson and Dannenburg, of 1948 (General Dynamics Exhibit 46), also describes tests with various blunt-nosed "nacelles" placed at various positions on the wing of a wing tunnel airplane model—but none of these positions, or bodies, corresponds to the location and shape required by Dr. Whitcomb's patent. General Dynamics' expert admitted that the additional nacelles all had "positive" drag coefficient numbers which indicated that the wing bodies proposed in this patent generally added to the drag of the airplane, in contrast to the reduction in such drag achieved by the invention of the patent in suit. Furthermore, the different shape of the bodies in this report produced a "sharp change" in the pressure over the surface of the wing, in contrast to the objective of Whitcomb's patent, which is to obtain a gradual deceleration and change of air pressure. The sharp change of

pressure produced by the nacelles of this report is not only undesirable at low subsonic speeds, but becomes very bad at higher speeds in the transonic region where the boundary layer separation problem sets in. The content of this report is not aerodynamically related to the invention of Whitcomb's patent in suit.

41. The report authored by Silvers, King and Pasteur, NACA RM L51H16, of 1951 (General Dynamics Exhibit 47), shows that the nacelles it describes when added to an airplane would reduce the drag rise Mach number, that is, cause the sharp increase in drag to occur at a lower speed. This is in contrast to the bodies of Dr. Whitcomb's patent in suit which have the effect of delaying or increasing the drag rise Mach number. The report generally tests the nacelles in an "underwing" position, but when it tested such nacelles in an "overwing" location, it reported that this led to the bad effects of "increased nacelle interference drag." In fact, the drag for the overwing placement of the nacelle was always much higher at all speeds tested in the report, and General Dynamics' expert testified that, "these are bad results," and that this "particular type of nacelle is no good" in this report. The evidence also shows that the nacelles are of a different shape from those called for in Dr. Whitcomb's patent. The content of this report is, therefore, also aerodynamically unrelated to the invention of the patent in suit.

42. The Baldwin and Dickey NACA RM A54J19 of 1955 (General Dynamics Exhibit 48), is not directed to problems of transonic flight, but is an attempt to apply certain "area rule" theories to supersonic speeds. Investigations of such supersonic speeds are not relevant to the problems of boundary layer separation involved in the patent in suit because the basic laws of aerodynamics reverse at the speed of sound. Furthermore, while the supersonic region of flight is somewhat theoretically predictable, the transonic region of flight is well established as an unpredictable situa-

tion. While the report shows added bodies or nacelles on the wing of an airplane wind tunnel model, when these bodies were added to the 'area rule" configuration, they produced a higher drag in the subsonic regions of flight. The bodies of this report are "tandem" bodies, part extending forward of the wing and having a "waisted" portion, and were unfavorable because they caused a low flight speed drag which was too large. This report again has no relationship to Dr. Whitcomb's patent in suit.

43. Evidence of four Russian airplanes, the TU-104, the "Badger," the "Bison," and the "Bear" was also offered as "prior art." (General Dynamics Exhibit 49-51). The evidence indicates, however, that while the Russian airplanes were developed by competent aerodynamicists, to achieve as high a speed as possible according to the state of the art at that time, the best the Russian designers were able to achieve was an airplane of much lower speed (100 knots slower) than that of the infringing Convair 990 aircraft. There is no evidence that any of these airplanes incorporated a "wing body" structure in any way similar to the anti-shock bodies of Dr. Whitcomb's invention—the only "protuberances" appearing on the upper surface of the wings of these airplanes was associated, essentially, with a large landing gear housing mounted underneath the wing[s]. The upper protuberances were not established as having any of the features specified in the claims of Whitcomb's patent, and there is no evidence that these protuberances had any effect whatsoever in controlling or solving the boundary layer separation problems.

44. While evidence was introduced (General Dynamics Exhibit 52 and 52a) of certain experiments (Hütter Report) which took place during World War II on the Focke-Wulf FW-190 German fighter airplane, and specifically a modification including a "Doppelreiter" body on the wing thereof, this evidence did not establish that such experimental airplane utilized a structure corresponding to that

defined by the claims of the Whitcomb patent, nor that the German experimental structure was effective to achieve the purposs of Dr. Whitcomb's invention. The micro-file report describing this airplane shows that the "Doppelreiter" body did not have a forward region, just ahead of the maximum thickness of the wing, which had a cross-sectional area increasing approximately the same as a cone, as is required by the claims of Dr. Whitcomb's patent. Exactly the contrary was established by competent and believable evidence, which was unchallenged by the defendant. It is also clear that the "Doppelreiter" added to the drag of this Focke-Wulf airplane, which only flew at speeds of about 260 mph. It was also admitted that the "Doppelreiter" body was not placed upon the airplane for the purpose of suppressing shocks, which is, by contrast, a specific purpose and achievement of the anti-shock bodies of Dr. Whitcomb's patent.

45. The series of Royal Aircraft Establishment Reports (AERO Reports) (General Dynamics Exhibits 11-19) were introduced as evidence of aerodynamic developments in England prior to the Whitcomb invention. None of these reports, however, discloses a body mounted in the mid-semi-span region of the wing of an airplane where the Whitcomb bodies are to be located. Generally, these reports fall into two classifications: one group relating to investigations of interference effects on the *tail* unit of airplanes, and one group relating to interference effects of *wing and fuselage* combinations. None of these reports teaches the Whitcomb concept of adding bodies to the wing semi-span to delay shock-induced drag rise.

46. AERO Report 2908 (General Dynamics Exhibit 11) by Küchmann and Weber is entitled: "The Supersonic Flow Past Swept Wings at Zero Lift Without and With Body." The *"body"* referred to *is* really *only the fuselage* of the airplane, and there is no teaching in this report that one should add bodies to the mid-semi-span of the wing.

The specific objective of this study is to reduce the interference effects between the wing and fuselage, and the method indicated of achieving this is to indent the fuselage in order to straighten the isobars (imaginary lines of equal pressure) on the wings. This straightening of isobars is contrary to the effect of the bodies of the Whitcomb patent.

47. AERO Reports 2109 (General Dynamics Exhibit 15), 2382b (General Dynamics Exhibit 16), 341 (General Dynamics Exhibit 17), all involved Dr. Küchemann, were classified as "secret" during and at all times relevant to being "prior art" in this suit, and accordingly were held inadmissible as (a) prior publication or (b) evidence of prior knowledge, unless it could be shown that Whitcomb had actual knowledge thereof—which General Dynamics has failed to establish. Nevertheless, by way of comment, all of the AERO Reports, including 2296 (General Dynamics Exhibit 12) and 2260 (General Dynamics Exhibit 13) all are concerned only with studies of the *tail unit* of an airplane, specifically, the junction of the fin and tail-plane. None of these reports are concerned with the effect of a boundary layer separation on lifting wings, and therefore not aerodynamically related to the Whitcomb patent. In these reports there is reference to "junction fairings" and "bullet fairings" added to the tail-plane unit. The general conclusion of the reports, however, is that such would have no effect on critical Mach numbers and would be of little use at high speed from the standpoint of drag.

48. AERO Reports 2901 (General Dynamics Exhibit 15), AERO 2832b (General Dynamics Exhibit 16) and AERO 341 (General Dynamics Exhibit 17) were classified documents at all times prior to the filing of Whitcomb's patent application on November 13, 1957. AERO Reports 2382b and AERO 341 were never received at the Technical Library at Langley Field. The WADC Technical Note 56-236 (General Dynamics Exhibits 40 and 57) was a classified

document at all times prior to 1966. There is no evidence that the photographs of the "Gloster Javelin" attached to the King affidavit (General Dynamics Exhibit 40) were ever received within the United States at any time prior to the filing of Whitcomb's patent application on November 13, 1957.

49. The evidence relating to the "Gloster Javelin" indicates that the bodies affixed to the trailing edge of the wing of that airplane were not conceived for the purpose of controlling shock-induced boundary layer separation. In any event, the bodies were located well rearward of the maximum thickness of the wing and there is no evidence that the forward region of these bodies had a conically increasing cross-sectional area. The only contemporaneous report shows that the bodies had no effect on the magnitude or onset of buffet. It was concluded that there was no advantage to the bodies and they were not included in the production airplane.

50. Considering all of the items of prior art relied upon by General Dynamics and American Airlines, no prior patent or publication discloses an elongate body shaped and positioned as specified in claims 1, 2 and 3 of the Whitcomb patent, on the wing panel of an airplane to control shock-induced boundary layer separation, and to reduce drag in the transonic region of flight.

51. None of the prior patents or publications relied upon by General Dynamics and American Airlines anticipate the invention of the Whitcomb patent in suit.

52. The prior patents and publications relied upon by General Dynamics and American Airlines did not make either the concept or the claimed invention of the Whitcomb patent in suit obvious to one of ordinary skill in the art, at any time prior to Whitcomb's invention.

53. There is no evidence of any fraud or other inequitable or bad faith conduct on the part of Dr. Whitcomb in either

the acquisition of his patent rights or in his contacts with General Dynamics. Dr. Whitcomb is in no way estopped from enforcing the patent in suit against either General Dynamics Corporation or American Airlines, Inc.

* * * * * * * * * *

Conclusions of Law

1. This Court has jurisdiction over the subject matter of the controversy which is the infringement of U.S. Patent 2,967,030 to Richard T. Whitcomb, has jurisdiction over the persons of each of the parties, and venue in this district is proper. 28 U.S.C. §§ 1338(a), 1391 and 1400(b).

2. Richard T. Whitcomb is the owner of the entire right, title and interest in and to United States Patent 2,967,030, subject only to an irrevocable royalty-free license granted by him to the United States Government, for governmental purposes, pursuant to 35 U.S.C. § 266. There is no proof of fraud, bad faith, or any other inequitable conduct on the part of Richard T. Whitcomb which would estop him from enforcing patent 2,967,030, against either General Dynamics Corporation or American Airlines, Inc.

3. The Whitcomb patent, 2,967,030, was duly and regularly issued by the United States Patent Office.

4. The Whitcomb patent, 2,967,030, is not invalid for lack of novelty under 35 U.S.C. § 102.

5. The Whitcomb patent, 2,967,030, is not invalid for obviousness under 35 U.S.C. § 103.

6. Claims 1, 2 and 3 of the Whitcomb patent, 2,967,030, have been infringed by the manufacture and sale by General Dynamics of the Convair 990 and 990A aircraft. 35 U.S.C. § 271.

7. Richard T. Whitcomb is entitled to an award of damages for infringement of United States Patent, 2,967,030.

8. Damages will be the subject of a separate inquiry. The parties will hold an initial conference in the office of counsel for the plaintiff on Friday, February 27, 1970, at 11:00 A.M., towards agreeing upon suitable alternate dates for such hearing.

9. Counsel for the plaintiff will prepare an appropriate order in keeping with the conclusions herein expressed and making reference to this Memorandum.

JOHN A. MACKENZIE
United States District Judge

Norfolk, Virginia
February 12, 1970

A. 24

Filed Feb. 24, 1970

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
NEWPORT NEWS DIVISION

CIVIL ACTION No. 1174

RICHARD T. WHITCOMB, *Plaintiff*,

v.

AMERICAN AIRLINES, INC., *Defendant*.

and

CIVIL ACTION No. 1133
GENERAL DYNAMICS CORPORATION, *Plaintiff*,

v.

RICHARD T. WHITCOMB, *Defendant*.

Order

These causes having come on for trial before this Court, and the trial having been completed, and the Court having considered briefs and proposed Findings of Fact and Conclusions of Law by both parties, and having heard arguments of counsel for both parties, and the Court having heard and considered all of the evidence adduced and being fully advised in the premises and having entered its Memorandum opinion, including the Findings of Fact and Conclusions of Law of this Court, in these causes on February 12, 1970, it is hereby

ORDERED, ADJUDGED AND DECREED as follows:

1. United States Patent 2,967,030 is good and valid in fact and in law.

2. The party Richard T. Whitcomb is entitled to an award of damages for the infringement of the valid United

States Patent 2,967,030 by General Dynamics Corporation in No. 1133, and American Airlines, Inc. in No. 1174.

3. The Complaint by General Dynamics Corporation in No. 1133 and the Counterclaim by American Airlines, Inc. in No. 1174 are hereby dismissed with prejudice.

4. This Court retains jurisdiction of these Actions for further consideration of the award of damages and any other relief to which the party Richard T. Whitcomb is entitled.

DONE AND SO ORDERED at Norfolk, Virginia, this 24th day of February, 1970.

JOHN A. MACKENZIE
John A. MacKenzie
United States District Judge

A True Copy, Teste:
W. FARLEY POWERS, JR., *Clerk*

By G. R. OLD
Deputy Clerk

UNITED STATES COURT OF APPEALS
FOR THE FOURTH CIRCUIT

No. 14,629

GENERAL DYNAMICS CORPORATION, and
AMERICAN AIRLINES, INC., *Appellants,*

v.

RICHARD T. WHITCOMB, *Appellee.*

Appeal from the United States District Court for the Eastern District of Virginia, at Newport News.

John A. MacKenzie, District Judge.

(Argued December 8, 1970 Decided June 15, 1971.)

Before SOBELOFF,* WINTER and CRAVEN, *Circuit Judges.*

William K. Kerr (Albert E. Fey, and Fish & Neave; Jack E. Greer, and Williams, Worrell, Kelly & Worthington on brief) for Appellant, and Carl G. Love (William K. West, Jr., Donald J. Bird, and Cushman, Darby & Cushman; Edward L. Breeden, III, and Breeden, Howard & MacMillan on brief) for Appellee.

SOBELOFF, Senior Circuit Judge:

The patent which is the subject of this litigation pertains to a device in the field of aerodynamics. Richard T. Whitcomb is the holder of United States Letters Patent No. 2,967,030 for a "Boundary-Layer Control Means for Lifting Wings." General Dynamics Corporation brought suit against Whitcomb for a declaratory judgment that his patent is invalid and not infringed by General Dynamics. Whitcomb counterclaimed, seeking damages for infringement. A second suit was instituted by Whitcomb against

* Judge Sobeloff attained the status of Senior Circuit Judge on December 31, 1970.

American Airlines, Inc., for infringement of the same patent. American counterclaimed for a declaratory judgment of the patent's invalidity and its noninfringement.

American's asserted liability stems from its purchase and utilization of General Dynamics' Convair 990 aircraft. The issues raised by the two law suits are identical and they were accordingly consolidated for trial. The District Court found the patent valid and infringed and held both General Dynamics and American Airlines liable for an award of damages to Whitcomb. We reverse upon our conclusion that the General Dynamics plane does not infringe the patent.

The mechanical devices at issue in this case, sometimes referred to as "aerodynamic antishock bodies" or "speed capsules," are intended to diminish the adverse effects of an airflow phenomenon known to aerodynamicists as boundary layer separation. During flight, the air which is displaced by an airplaine wing and forced to flow over the wing's upper surface actually moves at a faster speed than the plane itself. Thus, if an airplane is traveling at transonic speeds, i.e., speeds below but near the speed of sound, a portion of the airflow over the wing will be moving at speeds equal to or greater than the speed of sound.

At the point where the air velocity drops from supersonic to subsonic speed, a sharp pressure change or "shock wave" occurs which causes the layer of air immediately adjacent to the wing to separate and lift up from the wing—the condition known as boundary layer separation. As a result, the smooth airflow over the wing deteriorates into a very turbulent flow which adds substantially to the drag on the wing. Once a plane reaches speeds in this transonic range, small increments of additional speed create large increments of additional drag. This drag rise phenomenon acts as a speed barrier preventing a plane from further accelerating without substantial expenditure of power.

The patentee has been employed by the National Advisory Committee for Aeronautics (NACA) since 1943.[1] Prior to 1957 he was aware of efforts being made to prevent boundary layer separation or at least increase the critical speed at which the drag rise phenomenon begins to occur. In January 1957, working at home on his own time, Whitcomb conceived the idea of adding "antishock bodies" to the wings to reduce boundary layer separation.

The Whitcomb antishock body, shaped rather like a slender, elongated football, though it is considerably larger,[2] is situated on top of the wing. It extends just forward of the thickest part of the wing, with the thickest part of the antishock body located near the trailing edge of the wing. It was Whitcomb's theory that such bodies, by decelerating the airflow over the wing, would enable a plane to reach higher speeds before experiencing substantial drag rise. Subsequent wind tunnel tests confirmed that the antishock bodies smooth the flow of boundary layer air at transonic speeds, and that a wing without antishock bodies experiences drag rise at a lower speed than the same wing with the bodies added. On January 3, 1961, U.S. Letters Patent No. 2,967,030 were issued to Whitcomb for his invention.

Each General Dynamics Convair 990 employs four wing bodies very similar to Whitcomb's. He alleges that the two outboard antishock bodies are so similar as to infringe his patent. On appeal from the District Court's judgment in Whitcomb's favor, General Dynamics and American Air-

---

[1] In 1958 the title of NACA was changed to the National Aeronautics and Space Administration. Because the old name was still in effect when Whitcomb conceived his invention in 1957, it will be used throughout this opinion for the sake of consistency.

[2] On the Convair 990 the two outboard antishock bodies which are alleged to infringe Dr. Whitcomb's patent are each over 24 feet long. The four bodies on the 990, which serve a secondary function as fuel tanks, hold a total of 1136 gallons of fuel.

lines raise four major contentions: (1) that title to the patent should have vested in the Government, (2) that the patent is invalid because obvious in light of the prior art, (3) that they have not infringed the patent, and (4) that Whitcomb by his failure promptly to assert his ownership of the invention, has granted General Dynamics an implied license to utilize his patent. Because we hold that the Convair 990 wing bodies do not infringe the patent, we do not reach the other three issues.

II.

The issue of infringement turns on the wording of claim 1 of Whitcomb's patent:

> 1. In an airplane, a fuselage, a wing panel extending from said fuselage, and an elongate body on the upper surface of said wing panel and extending generally chordwise thereof, said elongate body having a forward region of a progressively increasing cross-sectional area approximately the same as that of a cone and *extending just forward of the wing panel region of maximum thickness*, said elongate body further having a region of maximum cross-section near the wing panel trailing edge, and a rear tapered portion extending aft of the wing panel trailing edge. (Emphasis added.)

In contrast to the portion of claim 1 emphasized above, the challenged General Dyanamics wing bodies extend four feet forward of the region of maximum wing thickness—53% of the distance from that region to the leading edge of the wing.

The District Court found that the General Dynamics wing bodies do extend "just forward" of the wing panel region of maximum thickness. We hold that finding to be clearly erroneous. If we are to give any substantive content to

the phrase "just forward" as distinct from any other type of "forward," it must mean "slightly forward" or "barely forward" of the region of maximum thickness. In our view no permissible reading of the phrase "just forward" can encompass the extension of wing bodies four feet forward; the General Dynamics wing bodies extend too far toward the leading edge of the wing to fit the explicit words of the patent.

Whitcomb attempts to escape the plain and unartificial reading of the patent by arguing that his invention has a nose of some rearward dimension. This entire nose is allegedly situated "just forward" of the region of maximum thickness and therefore the "apex" of the nose may be situated well forward of that region. Regardless of whether the word "nose," more than the word "apex," carries some connotation of a distinguishable forward section, we do not construe claim 1 to suggest that the forward region of the patented body may extend as much as four feet forward of the wing panel region of maximum thickness. We think it more reasonable to read claim 1 as describing a forward region that extends *to* just forward of the wing panel region of maximum thickness and no farther.

This leaves us the question whether the General Dynamics outboard antishock bodies are sufficiently similar to the patented invention to fall within the doctrine of equivalents. The essence of the doctrine is that "if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same even though they differ in name, form, or shape." *Graver Tank & Mfg. Co.* v. *Linde Air Products Co.*, 339 U.S. 605, 608 (1950), quoting *Machine Co.* v. *Murphy*, 97 U.S. 120, 125 (1877).

In applying the doctrine of equivalents, two underlying principles must be kept in mind. First, as the *Graver Tank* case emphasizes, the primary purpose of the doctrine is to

prevent fraudulent evasion of the scope of a patent by means of "unimportant and insubstantial changes and substitutions in the patent which, though adding nothing, would be enough to take the copied matter outside the claim, and hence outside the reach of the law." 339 U.S. at 607. Second, differences in form and shape may weigh importantly in the balance "where form is of the essence of the invention." *Machine Co.* v. *Murphy*, 97 U.S. at 125.

The record in this case establishes that wing bodies similar to the outboard bodies on the General Dynamics planes deal more successfully with the boundary layer separation problem than bodies fitting the precise description of Whitcomb's claim 1. Indeed, Whitcomb himself, subsequent to submitting his patent application, tested various wing bodies differing from the original bodies disclosed by his patent. A NACA technical report prepared by him and submitted in evidence at trial compares the original Whitcomb bodies, which extended forward only 4% of the distance from the region of maximum wing thickness to the wing's leading edge, with a wing body extending forward 64% of that distance. At trial Whitcomb admitted that his investigations and report establish that a wing body which extends to the farther forward position is more effective than his original wing bodies.

Because this is a case where form and shape are of the essence of the invention, and General Dynamic's alteration does add to the effectiveness of the device, it cannot be considered a mere evasion of the patent. We hold, therefore, that there is no infringement either under the literal terms of the patent or under the doctrine of equivalents.

Reversed.

A. 32

Filed July 14, 1971

UNITED STATES COURT OF APPEALS
FOR THE FOURTH CIRCUIT

No. 14,629

GENERAL DYNAMICS CORPORATION, and
AMERICAN AIRLINES, INC., *Appellants,*

v.

RICHARD T. WHITCOMB, *Appellee.*

Order

Upon careful consideration of the Motion for Rehearing, and with the concurrence of Judges Winter and Craven, no member of the court having requested en banc reconsideration of the case, the Motion for Rehearing is hereby denied.

SIMON E. SOBELOFF
United States Circuit Judge

A True Copy, Teste:
SAMUEL W. PHILLIPS, *Clerk*
By DIANE HUDSON
Deputy Clerk

Whitcomb Exhibit 4
Whitcomb's Patent U. S. 2,967,030

Jan. 3, 1961 R. T. WHITCOMB 2,967,030

BOUNDARY-LAYER CONTROL MEANS FOR LIFTING WINGS

Filed Nov. 13, 1957 2 Sheets-Sheet 1

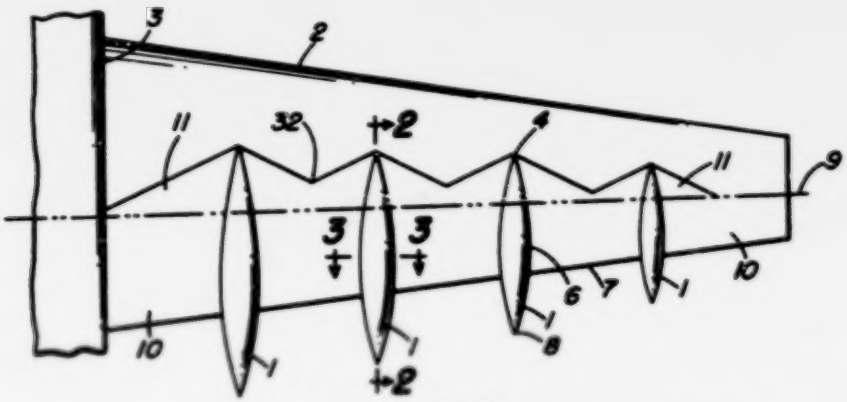

FIG. 1

FIG. 2

FIG. 3

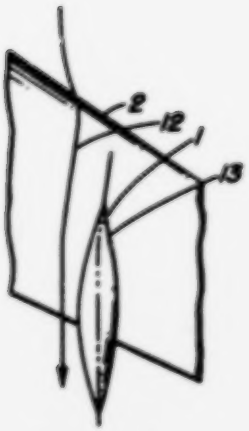

FIG. 4

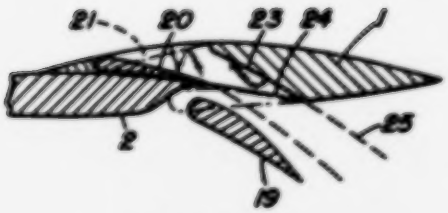

FIG. 5

INVENTOR
RICHARD T. WHITCOMB

BY R. J. Tompkins
ATTORNEYS

Jan. 3, 1961 R. T. WHITCOMB 2,967,030

BOUNDARY-LAYER CONTROL MEANS FOR LIFTING WINGS

Filed Nov. 13, 1957 2 Sheets-Sheet 2

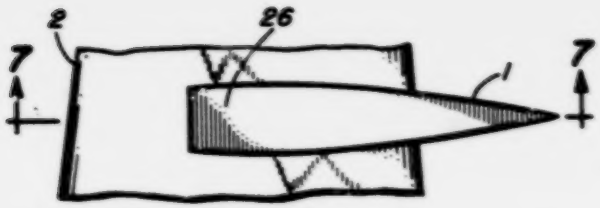

FIG. 6

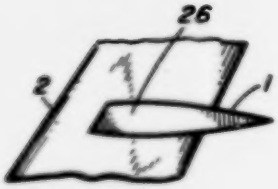

FIG. 10

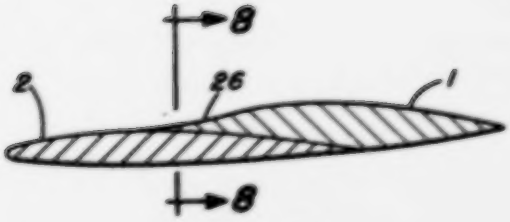

FIG. 7

FIG. 8

FIG. 9

INVENTOR
RICHARD T. WHITCOMB

BY R. I. Tompkins
ATTORNEYS

United States Patent Office

2,967,030
Patented Jan. 3, 1961

2,967,030

BOUNDARY-LAYER CONTROL MEANS FOR LIFTING WINGS

Richard T. Whitcomb, 63C Elizabeth Road, Hampton, Va.

Filed Nov. 13, 1957, Ser. No. 696,297

13 Claims. (Cl. 244—41)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to an aerodynamic configuration to reduce boundary-layer separation on the upper surface of a wing, or airfoil, near the speed of sound, and more particularly to an aircraft having bodies on the wing upper surface to delay boundary-layer separation.

When the speed of an airplane with a lifting wing approaches the speed of sound, boundary-layer separation usually develops on the upper surface of the wing. This separation, caused by a shock wave above the wing, results in substantial increases in drag, buffeting, stability problems, and other adverse aerodynamic effects. It is an object of the present invention to reduce the magnitude of this boundary-layer separation and its adverse effects through the addition of a group of special bodies on the wing.

The added bodies are primarily on top of the wing with the noses near or just ahead of the maximum thicknesses of the local wing sections, the maximum cross sections near the trailing edge of the wing, and the aft portions extending downstream of the trailing edge. The forward portions of these bodies decelerate the supersonic flow ahead of the shock wave with a resulting decrease of the strength of the shock and the associated boundary-layer separation. Also, the curvatures of the middle portions of the bodies reduce the adverse positive pressure gradient downstream of the shock wave which further reduces boundary-layer separation. The addition of such bodies to the wing, of course, results in adverse increases in the skin-friction drag and weight of the airplane. However, with the arrangement of the bodies to be described, at high subsonic speeds the favorable effect of the bodies on boundary-layer separation will considerably outweigh these adverse effects.

The objective of this invention is also accomplished by shaping the fuselage as described in my copending application, Serial No. 606,176, filed 24 August 1956, now U.S. Patent No. 2,874,922, issued 24 February, 1959. However, the present invention provides greater effectiveness since the major part of its favorable action is concentrated closer to the locality of most severe separation. The objective of the present invention is also accomplished with bodies added to the wing panels, which extend ahead of the leading edge and behind the trailing edge of the wing and are indented in the region of the wing. However, adding such bodies results in significant added skin friction and weight and flow interference near the wing leading edge. The adverse effects of these bodies are usually considerably more important than the favorable effect of the bodies on boundary-layer separation associated with the shock wave. These adverse effects are greatly lessened with the bodies described herein.

The invention is described by means of the following figures:

Fig. 1 is a partial plan view of an airplane with a representative embodiment of the present invention.

Fig. 2 is a cross-sectional view taken on line 2—2 of Figure 1.

Fig. 3 is a cross-sectional view taken on the line 3—3 of Figure 1.

Fig. 4 is a partial plan view of a swept back wing with an improved embodiment of the present invention.

Fig. 5 is a sectional side view of a further improvement of the invention for use with a wing trailing-edge flap.

Fig. 6 is a partial plan view of a wing with an additional improvement of the invention.

Fig. 7 is a cross-sectional view taken along line 7—7 of Fig. 6.

Fig. 8 is a cross-sectional view taken along 8—8 of Fig. 7.

Fig. 9 is a side view of a special fuselage preferably used with the present invention.

Fig. 10 is a partial plan view of a swept back wing with an alternative embodiment of the additional improvement shown in Fig. 6.

For the representative embodiment of the invention shown in Figures 1 and 2, relatively small bodies 1 are placed on the upper surface of the wing panel 2 which extends from the fuselage shown partially at 3. The noses 4 of the bodies 1 are near or just ahead of the maximum thicknesses 5 of the local wing sections; the maximum cross sections 6 are near the trailing edge 7 of the wing; and the aft portions 8 extend downstream of the trailing edge. The noses are usually at least one quarter of the local chord length rearward of the leading edge. For the greatest effectiveness, the longitudinal development of cross-sectional area, or rearwardly progressive variation in cross-sectional area, for roughly the forward 20 percent of the body lengths are approximately the same as for a cone. The ratio of length to width for the bodies is moderate and the longitudinal contours are smooth. The cross sections of the bodies may be circular as shown in Figure 3 or may have other shapes. One such alternate shape is described later. The bodies are most effective if located roughly one-half to one wing chord length apart as shown in Figure 1.

Flow surveys have indicated that for a usual wing, such as shown in Figure 1, with a normal amount of lift, the initial shock wave usually forms above the upper surface in the vicinity of shock line 9. This shock wave causes boundary-layer separation in the region 10 which lies between line 9 and the wing trailing edge. The shock wave is associated with the presence of a supersonic flow ahead of the shock, the strength of the shock depending on the magnitude of the supersonic velocities. The forward portion of the bodies 1 decelerates the supersonic flow gradually in the approximate region 11, resulting in a decrease in the strength of the shock 9 with a resulting decrease in the severity of separation in region 10. In addition, the severity of boundary-layer separation caused by the shock wave is greatly increased by a gradient of increasing pressure downstream from the shock 9. The curvatures of the midregion of the bodies 1 produce steamwise gradients of decreasing pressure downstream of the shock which partially counteract the adverse increasing gradient associated with the wing in this region. Thus, they result in further reduction of separation in the region 10. The adverse gradients of increasing pressure associated with the aft portions of the added bodies are primarily downstream of the trailing edge of the wing, and thus, have little effect on the separation on the wing.

Whitcomb Exhibit 4
Whitcomb's Patent U. S. 2,967,030

For a lifting sweptback wing the general air flow above the wing moves roughly as shown at 12 of Figure 4, with a slight inward inclination along the forward region and a turn outward above the aft region. Impingement of this laterally directed flow on added bodies with axes aligned with the flight directions, such as shown in Figure 1, causes significant adverse disturbances of the air flow in the vicinities of the bodies which result in local increases of boundary-layer separation. These local disturbances and the associated boundary-layer separation are markedly reduced by shaping the axes of the bodies so that they are roughly aligned with the air flow, as shown at 13 in Figure 4.

The favorable effects described would be accomplished by bodies which have considerable cross-sectional area below the wing. However, additions to the bodies below the wing would add little to the effectiveness as described but would add considerably to the skin-friction drag and weight of the bodies.

The added bodies may be modified, as shown in Figure 5, to provide an improvement in the effectiveness of a wing trailing-edge flap, such as shown at 19, in producing the highest possible lift increment. The modification consists primarily of a flap 20 which moves inside the body 1 between the full line position shown and the dotted line position 21, a ramp 23 inside the body and an opening 24 in the portion of the bottom of the body normally adjacent to the upper surface of the wing flap 19. The inner flap 20 is normally in the dotted line position 21. When the wing flap 19 is deflected downward to the full line position, to provide an increase in lift, the inner flap is also moved from its upper position 21 to the lower full line position. The surfaces of the inner flap and the ramp 23 then divert a stream of air 25 through the opening 24 over the upper surface of the wing flap 19. This stream of air, by reducing the adverse pressure gradients on the wing flap, results in a reduction of the tendency for boundary-layer separation on this flap. Since the maximum lift increment produced by the flap is normally limited by such boundary-layer separation, the stream of air 25 provides an increase in this maximum lift increment.

The effectiveness of the added bodies in reducing boundary-layer separation is improved by the special shaping of the forward portions 26 of the bodies shown in Figures 6, 7 and 8. The cross sections of the bodies are spread spanwise in these regions so that the forward portions of the bodies form wedges with gradually increasing thickness as shown in Figure 7. The contours of the bodies fair smoothly from this wedge to a cross-sectional shape roughly the same as that shown in Figure 1 near the wing trailing edge. When used with a sweptback wing, the leading edge of the wedge is obliquely inclined at approximately the angle of the wing sweep, as shown in Fig. 10. The deceleration disturbances produced by the noses of adjacent bodies intersect between the bodies as shown at 32 in Figure 1. These disturbances augment one another in these regions causing relatively large increases of pressure. With the noses of the bodies pointed as shown in Figure 1, the streamwise rates of increase of pressure in these local regions is sufficiently great to cause boundary-layer separation for many speed and lift conditions. The rates of increase of pressure and the associated separation in these regions are significantly reduced when the noses of the bodies are wedge shaped as shown in Figures 6, 7, and 8.

The value of the bodies added on the wing is significantly improved when these bodies are used in combination with a fuselage shaped as described in my said Patent No. 2,874,922. Such fuselage shapes result in airplanes in which the cross-sectional area in planes generally perpendicular to the longitudinal axis has only a substantially decreasing rate of change from near the nose until the rate of change is zero and has only a substantially negative increasing rate of change rearward of

the zero rate of change point. A side view of an airplane incorporating a fuselage with the special version of such a shape, described in my co-pending application Serial No. 683,431, filed September 11, 1957, now U.S. Patent No. 2,898,059, issued August 4, 1959, entitled, "Fuselage Shaping to Reduce the Strength of the Initial Shock Wave on Lifting Airplane Wings," is shown in Figure 9. The top of the fuselage 27 is contoured longitudinally with a concave curvature 29 in the vicinity of the leading edge of the wing-fuselage juncture 28, a downward slope 30 in the region of the forward portion of the juncture, a concave curvature 31 in the vicinity of the middle region of the juncture, and a longitudinally extending region of substantially constant cross-sectional area downstream of curvature 31. One of the important practical results of adding the bodies to the wing is that the Mach number at which a significant increase in drag occurs is delayed. It has been found experimentally that the delay associated with the bodies is increased significantly when the bodies are utilized in combination with a fuselage shaped as shown in Figure 9. Further, it has been determined experimentally that the adverse drag increment at lower speeds caused by the bodies is substantially reduced when the fuselage is shaped as shown.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

In the claims:

1. In an airplane, a fuselage, a wing panel extending from said fuselage, and an elongate body on the upper surface of said wing panel and extending generally chordwise thereof, said elongate body having a forward region of a progressively increasing cross-sectional area approximately the same as that of a cone and extending just forward of the wing panel region of maximum thickness, said elongate body further having a region of maximum cross section near the wing panel trailing edge, and a rear tapered portion extending aft of the wing panel trailing edge.

2. The apparatus of claim 1, said body being circular in cross section.

3. The apparatus of claim 1, said body having a straight axis extending in the flight direction.

4. The apparatus of claim 1, said body having an axis in approximate alignment with the airflow.

5. In an airplane, a fuselage, a wing panel extending from said fuselage, and an elongate body on the upper surface of said wing panel and extending generally chordwise thereof, said elongate body having a nose generally wedge-shaped in longitudinal cross section tapering to a minimum thickness just forward of the wing panel region of maximum thickness and being smoothly faired to a region of substantially circular cross-section, the maximum region of said substantially circular cross section being near the wing panel trailing edge, and a rear tapered portion extending aft of the wing panel trailing edge.

6. In an airplane, a fuselage, a wing panel extending from said fuselage, said wing panel having a trailing edge flap, an elongate body on the upper surface of said wing panel and extending rearwardly of the wing trailing edge, a slot extending generally downwardly and rearwardly through said body from the upper surface to the lower surface thereof, and a member in the upper part of said body movable from a slot intake closing position to a slot intake opening position, said flap lying in closing relationship to the outlet of said slot when in the retracted position.

7. In combination with an airfoil, at least one elongate closed body on the upper surface of said airfoil aligned with the direction of air flow over said airfoil, the nose of said body being located just ahead of the region of maximum thickness of said airfoil, the forward region of said body having a progressively increasing cross-sec-

Whitcomb Exhibit 4
Whitcomb's Patent U. S. 2,967,030

tional area from said nose to a maximum cross-sectional region substantially at the trailing extremity of said airfoil, and the after region of said body tapering to a terminus extending aft of said trailing extremity.

8. The combination of claim 7, wherein the nose and terminus of said body comprise apexes.

9. The combination of claim 7 wherein said body extends generally chordwise of said airfoil.

10. The combination of claim 7 wherein the forward region of said body is of a substantially conical configuration.

11. The combination of claim 7 wherein the separation distance between more than one of said bodies is approximately between one half and one chord of said airfoil.

12. The combination of claim 7 wherein the nose of said body is substantially wedge shaped.

13. The combination of claim 12 wherein the leading edge of said wedge shaped body nose is obliquely inclined at approximately the angle of sweep of said airfoil.

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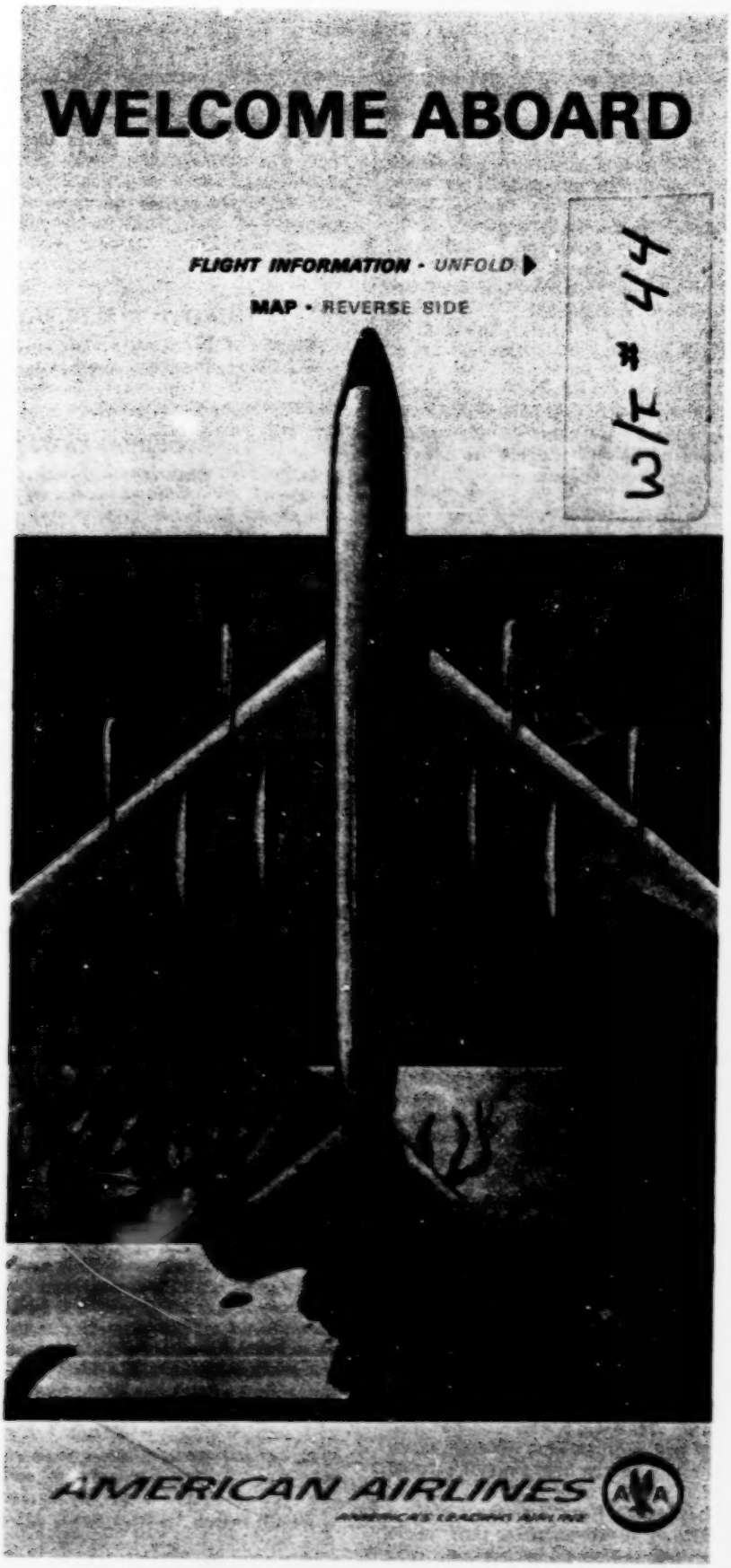
WELCOME ABOARD
FLIGHT INFORMATION · UNFOLD
MAP · REVERSE SIDE
W/T # 44
AMERICAN AIRLINES

SUPREME COURT, U. S.

Supreme Court, U.S.
FILED
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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 71- 503

RICHARD T. WHITCOMB, *Petitioner,*

v.

GENERAL DYNAMICS CORPORATION AND AMERICAN AIRLINES, INC., *Respondents.*

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FOURTH CIRCUIT

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PRESS OF BYRON S. ADAMS PRINTING, INC., WASHINGTON, D. C.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-

RICHARD T. WHITCOMB, *Petitioner,*

v.

GENERAL DYNAMICS CORPORATION AND AMERICAN AIRLINES, INC., *Respondents.*

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FOURTH CIRCUIT

Petitioner, Richard T. Whitcomb, plaintiff patentee and appellee below, prays that a Writ of Certiorari issue to review the judgment of the Court of Appeals for the Fourth Circuit, entered June 15, 1971, in the above-entitled case, adjudging that Petitioner's U. S. patent No. 2,967,030 issued January 3, 1961, was not infringed by the manufacture, use and sale of Respondents' Convair 990 commercial transport airplanes.

CITATIONS TO OPINIONS BELOW

The opinion of the Court of Appeals is reported at 170 U.S.P.Q. 242, and is reprinted in the Appendix hereto at pages A.26 to A.31*. Its unreported decision on Petition for Rehearing is presented at page A.32.

The Findings of Fact and Conclusions of Law of the District Court are reported at 164 U.S.P.Q. 610, and reprinted herein at pages A.1 to A.23, the unreported Order of that Court being reprinted at pages A.24-A.25.

JURISDICTION

The judgment of the Court of Appeals was entered on June 15, 1971 (A.26), and its order denying rehearing was entered July 14, 1971 (A.32), this Court's jurisdiction is invoked pursuant to 28 U.S.C. § 1254(1).

QUESTIONS PRESENTED

QUESTION NO. 1

Whether in reversing the District Court under the law of the "Doctrine of Equivalents", the Court of Appeals erred in reasoning that an accused device which allegedly includes a variation from the patented structure avoids infringement of a valid patent if the variation is thought to add to the effectiveness of the device, even though the allegedly modified accused structure simply follows the same inventive principles taught in the patent itself, and continues to perform the same function, in the same manner, for the same purpose, to achieve the same wholly novel result of the patent.

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* Page numbers preceded by capital letter "A." refer to the pages of the Appendix to this Petition for Certiorari. Page numbers preceded by Capital letter "R." refer to pages in the printed Appendix before the Fourth Circuit Court of Appeals. The symbol "FOF" refers to Findings of Fact, below. Petitioner Whitcomb trial exhibits are designated "W-", and Respondents' trial exhibits are designated "GD-". Emphasis in quotations is added throughout.

QUESTION NO. 2

Whether the Court of Appeals erred in departing from the basis this Court has directed for the determination of patent infringement, i.e. by a comparison of the accused device with the patent claims and specification, as construed in light of the prior art—and instead basing its determination of non-infringement solely upon a comparison of the accused device with certain of the inventor's research investigations, extraneous to the patent documents themselves.

Substantially, the same issue as is presented by these Questions, the legal tests for the determination of infringement of a valid patent, was recognized by this Court to be of substantial importance, when it granted certiorari in *Standard Industries, Inc.* v. *Tigrett Industries, Inc.*, No. 445, October 27, 1969, 396 U.S. 885. The importance of, and widespread interest in, these issues is underscored by the fact that both the Department of Justice and the American Patent Law Association requested, and were granted, leave to file, and did file, briefs amicus curiae in *Standard Industries, supra.* However, that case was then affirmed by an equally divided court, without opinion, 397 U.S. 586 (1970).

It has now been 21 years since this Court last rendered an opinion on these issues, by Mr. Justice Jackson in *Graver Tank & Mfg. Co.* v. *Linde Air Products Co.*, 335 U.S. 605, (1950) (which opinion was prior to the enactment of the presently controlling statute, 35 U.S.C. 271).

In the twenty-one (21) years since *Graver Tank, supra,* this Court has considered questions of "contributory infringement" (*Aro*),[1] standards of patent-

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[1] *Aro Mfg. Co.* v. *Convertible Top Replacement Co.*, (I) 365 U.S. 336, 5 L.ed 2d 592 (1961); (II) 377 U.S. 476, 12 L.ed 2d 457 (1964).

ability and obviousness" (*Graham*,[2] *Adams*,[3] *Anderson's Black Rock*),[4] "license estoppel" (*Lear*),[5] "collateral estoppel" (*Blonder-Tongue*),[6] and antitrust issues based on "fraud" in the procurement of a patent (*Walker Process*),[7] and on "misuse" of issued patents (*Zenith Radio*).[8] Thus, beginning about 1961, this Court has addressed itself to and rendered significant opinions on most of the important questions and issues in the patent law—*except for* the substantive interpretation of what constitutes infringement of a valid patent.

The absence since *Graver Tank* of more recent guidance by this Court on this issue has led, predictably, to the occurrence of confusion and conflict between the Circuits as to the proper construction and interpretation of patents in determining the existence of infringement, and particularly with respect to the Doctrine of Equivalents.

STATUTORY PROVISIONS INVOLVED

UNITED STATES CODE, Title 35:

112 The specification shall contain a written description of the invention, and of the manner and process of

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[2] *Graham* v. *John Deere Co.*, 383 U.S. 1, 15 L.ed 2d 545 (1966).

[3] *United States* v. *Adams*, 383 U.S. 39, 15 L.ed 2d 572 (1966).

[4] *Anderson's Black-Rock* v. *Pavement Salvage Co.*, 396 U.S. 57, 24 L.ed 2d 258 (1969).

[5] *Lear* v. *Adkins*, 295 U.S. 653, 23 L.ed 2d 610 (1969).

[6] *Blonder-Tongue Laboratories* v. *University of Illinois Foundation*, — U.S. —, 28 L.ed 788 (1971).

[7] *Walker Process Equipment Co.* v. *Food Mach. Corp.*, 382 U.S. 172, 15 L.ed 2d 247 (1965).

[8] *Zenith Radio Corp.* v. *Hazeltine Research, Inc.*, 395 U.S. 100, 23 L.ed 2d 129 (1969).

making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention. A claim may be written in independent or dependent form, and if in dependent form, it shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim.

* * * * *

271 Infringement of patent

(a) Except as otherwise provided in this title, whoever without authority makes, uses or sells any patented invention within the United States during the term of the patent therefor, infringes the patent.

281 Remedy for infringement of patent

A patentee shall have remedy by civil action for infringement of his patent.

STATEMENT OF THE CASE

The present case commenced as an action for infringement of Petitioner's U.S. patent No. 2,967,030 against Respondent, American Airlines, Inc. Subsequently, Respondent General Dynamics, brought a declaratory judgment action against Petitioner Whitcomb. The two cases were consolidated, and the parties aligned with Petitioner as plaintiff and the Respondents as co-defendants. (A. 2)

Petitioner, Dr. Richard T. Whitcomb is one of America's most valued and honored aerodynamicists, whose

earlier invention of the "Area Rule" is now the fundamental basis for the design of all supersonic aircraft.[9] More recently, he is the inventor of the "supercritical wing" which has been heralded as revolutionizing all future airplane wing design.[10] The invention of the patent in suit similarly received substantial publicity.[11]

Dr. Whitcomb holds absolute title to the patent in suit, by determination of the Government Patents Board, acting under Executive Order 10096, his rights being subject only to his previous voluntary grant of a royalty-free irrevocable, non-exclusive license to the United States for all governmental purposes.[12]

The patent in suit is for an invention which Respondent's own experts acknowledge to be "an important milestone", and the "breakthrough" they had been seeking "in aerodynamic theory" (FOF 18, A. 90), in the design and development of Respondents' accused airplane.[13]

In brief, the invention provides entirely novel aerodynamic antishock bodies, which are "special elongate bodies" added on the upper surface of an airplane wing (FOF 7, A. 5), to enable subsonic transport aircraft to "fly faster before the speed-inhibiting drag rise phenomenon occurs". (FOF 9, A. 6). This "drag rise is [otherwise] virtually a speed barrier through

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[9] See W-1, R. 985a-991a.

[10] New York Times, February 9, 1969, Front Page; Time Magazine, February 21, 1966, page 66 "Science".

[11] See W-13, R. 1010a and W-105, R. 1227a-1230a, FOF 15, A. 8.

[12] See GD-8 and GD-9, at R. 778a-780a, FOF 14, A. 7.

[13] Respondents admittedly derived their knowledge of the invention entirely from Petitioner Whitcomb and publications describing specific embodiments of his invention, (FOF 15-23, pages A. 8 to A. 11).

which the airplane may not pass". (FOF 4, A. 4). *Never before* had the result of Petitioner's invention been achieved. Previously, "it was well accepted among aerodynamicists that the addition of structure to an aircraft would result in an *increase* in the *drag* of the airplane in subsonic flight," (FOF 5, A. 4). By contrast, the Whitcomb bodies had the opposite effect of delaying the drag rise and thus *increasing the speed* of the airplane. (Court of Appeals, A. 28).

Respondents' own technical documents (W-49, R. 1068a) showed that the use of Dr. Whitcomb's invention was "the only way" to achieve the valuable speed increase they needed for this airplane (FOF 24-30, A. 11 to A. 13). As the District Court put it in a finding unchallenged by the Respondents or the Court below, this pioneering invention of Whitcomb's patent was, at the high subsonic speeds contemplated, so radical as to constitute "*a contradiction* to the absolutes of [aerodynamic] theory," (FOF 5, A. 4).[14]

After an eight day trial, and hearing testimony from eight "live" witnesses and receiving over two hundred and ten exhibits, as well as depositions and affidavits, the District Court below ruled in Petitioner's favor as to all defenses,[15] and found there was literal in-

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[14] Not unlike the nature of the invention and patent involved in *United States* v. *Adams*, 383 U.S. 39 (1966).

[15] The District Court upheld the validity of the patent, generally observing that Respondents' extensive prior art defenses (see A. 14) were completely unrelated to the invention of the patent in suit (see FOF 36-53, A. 15 to A. 21). Other rejected defenses included (i) General Dynamics' vigorous contention that they operated under the patent with an implied license (based on their admitted derivation of the invention from Whitcomb), as well as (ii) their accusation Dr. Whitcomb had retained title to his patent by fraudulent conspiracy with high government officials.

fringement of the claims in suit, specifically stating further, in a subsequent ruling written shortly after the decision, that infringement of the patent was "undoubtedly" present.

The Fourth Circuit Court of Appeals reversed, but *solely* on the issue of infringement (not reaching the other issues). The Fourth Circuit not only reversed the finding of undoubted *literal* infringement by the District Court, but went on to hold that infringement under the "Doctrine of Equivalents" was also avoided.

The Court's reasoning was that Respondents had altered one of the several specified positions of the patented structure and that this change did "add" to the effectiveness of the device. Accordingly, because the accused device allegedly had an "improved" performance over the form of the invention as shown in the patent, the Court held it was not an *equivalent* —even though there was otherwise no change in the form, shape, position, purpose, function, mode of operation or result of Respondent's structure as compared to that of the patent.[16]

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[16] The Court of Appeals itself recognized, and did not question, the effectiveness of Petitioner's antishock bodies, observing, "It was Whitcomb's theory that such bodies, by decelerating the airflow over the wing, would enable a plane to reach higher speeds before experiencing drag rise. Subsequent wind tunnel tests confirmed that the antishock bodies smooth the flow of boundary layer air at transonic speeds, and that a wing without antishock bodies experiences drag rise at a lower speed than the same wing with the bodies added. On January 3, 1961, U.S. Letters Patent No. 2,967,030 were issued to Whitcomb for his invention." (A. 28)

The Court of Appeals also recognized and stated that "Each General Dynamics Convair 990 employs 4 wing bodies *very similar to Whitcomb's*," and it was never really challenged that Respondents used their bodies for the purpose of performing the same function to achieve the same result in the same way as Whitcomb described in his patent.

This case thus presents to this Court, in a clear-cut factual setting, the most important question of what are the proper legal tests for the substantive determination of what constitutes infringement of a valid U.S. patent.

The Court is also presented with an opportunity for unraveling the conflict which now exists between the circuits, and for restating its views as to the proper substantive legal tests for determining the answer to the question of whether an accused device infringes a valid U.S. patent.

REASONS FOR GRANTING THE WRIT IN THIS CASE

PRIOR DECISIONS BY THIS COURT UNIFORMLY ADHERE TO LONG-STANDING PRINCIPLES OF EQUIVALENCY DISREGARDED BY THE COURT OF APPEALS BELOW

As noted above, *Graver Tank & Mfg. Co.* v. *Linde Air Products, Co., supra,* is the most recent opinion by this Court on the "Doctrine of Equivalents" and the applicable law of infringement. In *Graver Tank* (opinion by Mr. Justice Jackson), this Court stated, inter alia:

> But courts have also recognized that to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing. Such a limitation would leave room for—indeed encourage—the unscrupulous copyist to make unimportant and insubstantial changes and substitutions in the patent which, though adding nothing, would be enough to take the copied matter outside the claim, and hence outside the reach of law. One who seeks to pirate an invention, like one who seeks to pirate a copyrighted book or play, may be expected to introduce minor variations to conceal and shelter the piracy. Outright and forthright duplication is a

dull and very rare type of infringement. To prohibit no other would place the inventor at the mercy of verbalism and would be subordinating substance to form. It would deprive him of the benefit of his invention and would foster concealment rather than disclosure of inventions, which is one of the primary purposes of the patent system.

The doctrine of equivalents evolved in response to this experience. The essence of the doctrine is that one may not practice a fraud on a patent. Originating almost a century ago in the case of Winans v. Denmead (US) 15 How 330, 14 L ed 717, it has been consistently applied by this Court and the lower federal courts, and continues today ready and available for utilization when the proper circumstances for its application arise. "To temper unsparing logic and prevent an infringer from stealing the benefit of the invention" a patentee may invoke this doctrine to proceed against the producer of a device "if it performs substantially the same function in substantially the same way to obtain the same result." Sanitary Refrigerator Co. v. Winters, 280 US 30, 42, 74 L ed 147, 156, 50 S Ct 9. The theory on which it is founded is that "if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in name, form, or shape." Union Paper-Bag Machine Co. v. Murphy, 97 US 120, 125, 24 L ed 935, 936.

A span of, again, twenty-one years had occurred between *Graver Tank* and the two earlier leading cases by this Court on the question of interpretation of patents under the "Doctrine of Equivalents". Those cases were: *Temco Electric Motor Co.* v. *Apco Mfg. Co.,* 275 U.S. 331 (1928), and *Sanitary Refrigerator Company* v. *Alexander F. Winters,* 280 U.S. 30 (1929).

In both, the issue of infringement under the "Doctrine of Equivalents" was considered, infringement was found, and definitive expositions of this doctrine were announced:

In *Temco, supra,* this Court held:

> "* * * * * It is well established that an improver can not appropriate the basic patent of another and that *the improver without a license is an infringer* and may be sued as such. Cochrane v. Deener, 94 U.S. 780, 787, 24 L. ed. 139, 141; Cantrell v. Wallick, 117, U.S. 689, 694, 29 L. ed. 1017, 1918, 6 Sup. Ct. Rep. 970; Yancey v. Enright, 145 C.C.A. 51, 230 Fed. 641, 647; Reed v. Hughes Tool Co. (C.C.A. 5th) 261 Fed. 192, 194."

> "* * * * * We must consider that the [defendant's structure] was really an appropriation of the original design of the Thompson patent, *whether it be,* as we think it was, a patentable improvement thereon, or the mere equivalent of the casing and hanger." (275 U.S. at 328)

And, in *Sanitary Refrigerator, supra,* this Court stated:

> "* * * * * A close copy which seeks to use the substance of the invention and, *although showing some change in form and position,* uses substantially the same devices, performing precisely the same offices with no change in principle, *constitutes an infringement.* Ives v. Hamilton, 92 U.S. 426, 430, 23 L. ed. 494, 495." (280 U.S. at 42) (Emphasis Added)

Each of these cases clearly indicates that *whether or not* an infringer changes the "form or position" of a patented structure, and thereby makes some "improvement" thereon, so long as his acts constitute

an appropriation of the basic patented idea and his device continues to perform "precisely the same offices with no change in principle" (280 U.S. at 42, *supra*) —*he has infringed the patent.*

The present ruling by the Fourth Circuit is in *direct conflict* with and contrary to each of these foregoing decisions by this Court—both in logic and result. Moreover, the reasoning and result of the Fourth Circuit is in direct conflict with recent decisions of *at least six other Circuits,* as well as the Court of Claims—

THE DECISION BY THE FOURTH CIRCUIT BELOW IS IN DIRECT CONFLICT WITH THE DECISIONS OF AT LEAST SIX OTHER CIRCUITS, ALL OF WHICH FOLLOW THE OPINIONS OF THE SUPREME COURT

The Fourth Circuit's decision in this case is also in *clear and direct conflict* with the rulings and opinions rendered in *at least six* other Circuits, as well as in the Court of Claims.

Cases from the *Second, Third, Fifth, Seventh, Ninth and Tenth* Circuits *all* show that in those circuits it has been recognized that an accused infringer *cannot* avoid liability under 35 U.S.C. 271 merely because he introduces some variation in the precise form of the patented item which may "add to the effectiveness of the device" but, which otherwise in no way alters or departs from the purpose, function and result of the otherwise completely copied patented structure. *In general,* these other Circuits have held that even if such a modification of the patented structure constitutes an "improvement" to the exact form of the device shown in the patent this *"is irrelevant to the question of infringement".*

Such was the view of the **Second Circuit,** as it was stated in *American Safety Table* v. *Schreiber,* 269 F. 2d 255 (2 Cir. 1959), *cert. denied* 361 U.S. 915:

> ". . . if [defendant's device] be deemed an improvement, *it is irrelevant* to the question of infringement." (269 F. 2d at 264)

The **Second Circuit** expressly pointed out in a later decision, *International Latex Corp.* v. *Warner Bros. Co.,* 276 F.2d 557 (2 Cir. 1960), *cert. denied* 364 U.S. 816, that findings of non-infringement should not be based on the *"unreal"* issue of whether the accused structure was an improvement over the patented structure:

> " * * * neither the superiority of [defendant's modification] nor its being more expensive, in an unstated degree, would require a determination that it passed the bounds of equivalence in a proper case . . . *that issue is an unreal one* arising out of the attempted dichotomy of "equivalancy" as between fact and law." (276 F.2d at 563)

Using the same reasoning, the **Third Circuit** Court of Appeals has likewise pointed out that findings of non-infringement are not to be based on the notion that because defendant may have "improved" the patented structure infringement of the patent is thereby avoided, e.g. *Q-Tips, Inc.* v. *Johnson & Johnson,* 207 F.2d 509 (3 Cir. 1953), *cert. denied* 347 U.S. 935:

> " . . . to the extent it was *only* an improvement, the District Court could *not* have concluded against infringement." (207 F.2d at 511)

The **Fifth Circuit** has similarly repeatedly recognized that infringement based upon a theory of equivalency is to be upheld even though the accused device in fact

functioned more effectively than the patented structure. This was expressly so held in *E-I-M Co.* v. *Philadelphia Gear Works,* 223 F.2d 36 (5 Cir. 1955), *cert. denied* 350 U.S. 933, even where there was—

> " . . . convincing testimony . . . based upon actual tests, that the [accused] device actually functions more effectively [than the device under the patent]." (223 F.2d at 40)[17]

The **Fifth Circuit** made the same point again in *Up-Right, Inc.* v. *Safway Products, Inc.,* 315 F.2d 23 (5 Cir. 1965), *cert. denied* 375 U.S. 831, where infringement of the patent based upon "equivalency" was upheld even though—

> " . . . the accused device was simpler, safer and *more efficient* in operation, and also that it was substantially and materially different in structure, mode of operation, and result from the device of the patent.
>
> * * * * *
>
> " . . . we adhere to the established rule that the patent was *not limited to the preferred embodiments* shown in the claims or drawings.
>
> * * * * *
>
> "The law is that *substance is not to be subordinated to form so as to deprive one of the benefit of his invention.* And it is settled that if the accused device performs substantially the same function in substantially the same way to obtain substantially the same result, *it infringes.*" (215 F.2d at 26, 27)

---

[17] It should be noted here that in the present case no such "convincing testimony" or "actual tests" are present. The "comparison" the Court of Appeals relied upon was between two forms of the patentee's structures, one of which was "slightly superior" to the other. Respondent's structure corresponds to neither of these, but most closely resembles the structure of the drawing of the patent.

Even more recently, the **Fifth Circuit** again similarly upheld infringement in *Williams Bit & Tool Co.* v. *Christensen Diamond Products,* 399 F.2d 628 (5 Cir. 1968), pointing out that while defendant's device—

> " . . . may well be an improvement . . . *it is not a departure from the patent principle.* Likewise, we regard the other features of the accused [device] . . . as, at the most, improvements of the structure rather than departures from it. As such they do not avoid infringement of the patent." (399 F.2d at 635)

The **Seventh Circuit** is also in accord with these decisions, as can be seen from *Borg-Warner Corporation* v. *Mall Tool Co.,* 217 F.2d 850 (7 Cir. 1954), *cert. denied* 349 U.S. 946, wherein infringement was upheld even though the defendant's device varied from and was an improvement over the teaching of the patentee's.

> "From an examination of the evidence and the Court's finding, it seems clear that defendant's variation from [patentee's] teaching in this respect represents merely the improvement of a skilled mechanic, *while still adopting the exact teaching of* [*patentee*]." (217 F.2d at 852)

The **Ninth Circuit** has also similarly ruled, as in *Hansen* v. *Colliver,* 282 F.2d 66 (9 Cir. 1960) wherein infringement was again upheld even though the accused device was an improvement over the patented structure, the Court stating:

> "It may be, as indicated by the trial court, that appellees' device is superior in its simplicity in the use of a table top instead of a guide. *If the table top is an improvement it is nevertheless the equivalent of the guide and is merely a change in form."* (282 F.2d at 69)

A year after the Hansen case, the **Ninth Circuit** reemphasized this same approach and understanding of the law in *Neff Instrument* v. *Cohu Electronics,* 298 F.2d 82 (9 Cir. 1961), pointing out:

> "At best, then, it appears that the accused amplifier is *an improvement* over the plaintiff's amplifier. And it is well established that *an improver cannot appropriate the basic patent of another,* and that the improver without a license is an infringer, and may be sued as such.
>
> * * * * *
>
> And defendant's own advertising . . . evidences the fact that its amplifier performs the same functions (but better) that the plaintiff's amplifier performs. 'Whether the two devices are identical in this respect [the design of an element] is *not relevant* for they are identical functionally." (298 F.2d at 89, 90)

Such also is the interpretation of the law of the Doctrine of Equivalents by the **Tenth Circuit** as can be seen from, for instance, *McCullough Tool* v. *Well Surveys, Inc.,* 343 F.2d 381 (10 Cir. 1965) *cert. denied* 383 U.S. 933, 385 U.S. 990, 384 U.S. 947, 385 U.S. 995, which succinctly states:

> " . . . infringement *cannot be avoided* by the mere fact that the accused device is more or less efficient or performs additional functions." (343 F.2d at 402)

Only last year the **Court of Claims** followed the same reasoning of the above Circuits and upheld infringement, under the "Doctrine of Equivalents", in *Palmer* v. *United States,* 423 F.2d 316 (Ct. Cls. 1970) *cert. denied* 400 U.S. 951, even though the accused devices were acknowledged to be improvements:

> "While no doubt the accused structure is *a practical improvement* over the embodiment shown

in the patent, its *means, function and result are essentially the same.*" (423 F.2d at 323)

Each of the eleven (11) cases just cited, variously from the Second, Third, Fifth, Seventh, Ninth and Tenth Circuits, and the Court of Claims, relied on the views expressed by this Court in *Graver Tank, supra,* as the basis for their reasoning. Many of them also cited and rely on *Sanitary Refrigerator, supra,* and *Temco, supra.* Each clearly holds that it is improper as a matter of law, to conclude non-infringement simply on the basis that,

(a) the accused device has some variation from the patented structure, which variation,

(b) contributes some improvement or adds to the effectiveness of the structure devised by the patentee, where,

(c) the accused device performs the same function, by the same means for the same purpose as taught by the patent.

Each of these eleven (11) cases recognizes that when the accused device simply follows the teaching of the patent and incorporates the same means, function and result of the patented device, it is *at least* an infringement of that patent under the "Doctrine of Equivalents". This result is reached whether the patent involved was of the nature of a pioneering invention, or involved only a "narrow" contribution to the art.[18]

---

[18] Of course, nearly all cases recognize that a patent for a "pioneering" invention such as is petitioner Whitcomb's patent in this case (see page 7, *supra*), is entitled to a broader range of "equivalents" than are patents for narrower inventive contributions.

Such has been the law consistently pointed out by this Court, as the Sixth Circuit observed in *Aluminum Company of America* v. *Sperry Products, Inc.*, 285 F.2d 911 (6 Cir. 1960)—

> An infringement said the court in Westinghouse v. Boyden Power Brake Co., 170 U.S. 537, 569, 18 S.Ct. 707, 723, 42 L.Ed. 1136, quoting from Burr v. Duryee, 1 Wall. 531, 573, 17 L.Ed. 660, "is a copy of the thing described in the specification of the patentee, either without variation, or with such variations as are consistent with its being in substance the same thing. If the invention of the patentee be a machine, it will be infringed by a machine which incorporates in its structure and operation the substance of the invention; that is, by an arrangement of mechanism which performs the same service or produces the same effect in the same way, or substantially the same way. (285 F.2d at 923)

The opinion and decision by the Fourth Circuit Court of Appeals in the present case is in *direct conflict* with each of the above decisions from at least six (6) other circuits, as well as the Court of Claims. It is also in direct conflict with the decisions by this Court in the *Graver Tank, Temco* and *Sanitary Refrigerator,* all cited, *supra.*

Even if it is assumed that the accused antishock bodies used by the Respondents on the General Dynamics' Convair 990 airplanes, *are* an "improvement" over the precise structure shown in Petitioner's patent drawings—it remains that the accused antishock bodies are not only admittedly "very similar" to the bodies of Dr. Whitcomb's patent, but unquestionably also that their "means, function and results are essentially the same."

The similarity of the accused bodies to the patented bodies can be readily seen from the figures of the patent (page 33a) and from a re-produced picture of Respondent's Convair 990 airplane (page 38a).[19] The patent claim defines the form and shape of the bodies as having:

(1) an elongated body, with

(2) a forward region of progressively increasing cross-sectional area approximately the same as a cone, while

(3) the body then increases to a maximum cross-section; and thereafter,

(4) the body has a rear, tapered portion.

There is *no difference* between the "form and shape" of Respondent's accused antishock bodies and the teaching of the patent, and *none* was pointed out by the Court below. The accused bodies *each* have the conical forward region, the maximum cross-section near the trailing edge of the wing, and a tapered rear portion extending aft of the trailing edge just like in the patent.

The patent also teaches a placement of the antishock bodies on the airplane wing such that they are,

(1) on the upper surface of the wing; with

(2) the conical "forward region" extending "just forward" of the region of maximum thickness of the wing; while,

(3) the maximum cross-section of the bodies lies "near the wing panel trailing edge"; and,

---

[19] While the patent drawing shows 4 bodies on each wing, and the 990 airplane has two, the patent's disclosure and its claims teach the possible use of only one such body. The issue of non-infringement does *not* depend on the ***number*** of bodies on the airplane.

(4) the rear tapered portion of the body extends aft of the trailing edge of the wing.

Respondent's bodies admittedly comply fully with three of these four specifications, viz Nos. 1, 3 and 4.

The infringement issue thus turns solely on the alleged change of a single position of Respondent's bodies (the second criterion above), and the question of whether the accused structure with that single variation remained at least an "equivalent" of the patented device.

There is no prior art, or Patent Office history, which requires any restriction of the scope of the patent to uphold its validity, and none was cited by either court below—but, in nonetheless placing an improper narrow construction on the claims, the Fourth Circuit Court of Appeals below fell into further conflicts and errors of law, as follows:

THE DECISION OF THE FOURTH CIRCUIT IS IN FURTHER CONFLICT WITH DECISIONS OF THIS COURT AND OTHER CIRCUITS IN DEPARTING FROM THE PRINCIPLES THAT A PATENT CLAIM IS TO BE READ WITH ITS SPECIFICATION, AND INFRINGEMENT DETERMINED BY THEM COMPARING THE ACCUSED DEVICE WITH THE CLAIM AS THUS CONSTRUED

The failure of the Court of Appeals to follow the principles of law laid down by this Court, and the other Circuits, is further dramatically revealed by the fact that its construction and interpretation of the claim of petitioner's patent in suit is so narrow *that the claim would not be infringed by even the specific embodiments disclosed in the patent itself.*

To reach this result, the Fourth Circuit again failed to heed, and placed itself in direct conflict with, the decisions of this Court and those of the other Circuits.

What the Fourth Circuit did was to construe the patent claim without reference to the patent specification itself, and then to determine non-infringement by a comparison of the accused device with the patentee's *initial* research investigation—while, again, ignoring the disclosures of the patent itself.

By contrast, this Court recently pointed out that,

> "it is fundamental that claims are to be construed in the light of the specifications and *both* are to be read with a view to ascertaining the invention."

United States v. *Adams,* 383 U.S. 39, at 49 (1966). The same point was earlier stated in *Graver Tank & Mfg. Co.,* supra:

> "What constitutes equivalency *must be determined against the context of the patent,* the prior art, and the particular circumstances of the case. Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect."
>
> (339 U.S. 605, at 609)

Indeed, prior to its decision below, the Fourth Circuit itself had similarly stated, *Marvel Specialty Co., Inc.* v. *Bell Hosiery Mills,* 330 F. 2d 164, (4 Cir. 1964):

> "Of course, equivalency in patent law cannot be determined in vacuo The question of infringement must be considered in the context of the prior art and with an eye to the contribution made by the patented invention."
>
> (330 F. 2d at 176)

The Second Circuit also pointed out in *Reiner* v. *I. Leon Co.,* 285 F. 2d 501 (2 Cir. 1960):

> *"A claim must of course read upon the specifications,* but the specifications, unless so declared,

> are *only an example of what the claim is intended to cover;* it is a species of a broader genus, else no claims would cover anything not literally described in the specifications."
>
> (285 F. 2d at 504)

Moreover, it is "axiomatic" in the patent law that infringement depends, not upon a comparison of the Defendant's accused product with the patentees' product, but upon a comparison of the accused device with the patent itself. *Walker on Patents,* Deller's Ed. (1937), § 450, p. 1681; *Magnavox Co.* v. *Hart & Keno,* 73 F. 2d 433, 455 (9th Cir. 1934). Obviously, a patentee's experimental or commercial devices may not correspond with the actual invention patented, and are thus well recognized as providing only a misleading basis for comparison.[20]

Departing completely from the principles of these decisions, what the Fourth Circuit did in this case was to refer to the Petitioner's earliest research investigations of his invention, and then limit the patent claim to the specific embodiment of Petitioner's initial experiment! It was from this analysis that the Court of Appeals derived its statement (A.31), that,

> ". . . the original Whitcomb bodies . . . extended forward only 4% of the distance from the region of maximum wing thickness to the wing's leading edge . . .".

---

[20] See *American Technical Machinery Corp.* v. *Caparotta,* 339 F.2d 557 (2d Cir. 1964) cert. den. 382 U.S. 842; *Taylor-Reed Corp.* v. *Mennen Food Products,* 324 F.2d 108 (7th Cir. 1963); *Kromer* v. *Riegal Textile Corp.,* 227 F.2d 741 (7th Cir. 1955) cert. den. 350 U.S. 1007; *Keller* v. *Sprout, Waldron & Co., Inc.,* 129 U.S.P.Q. 465 (S.D.N.Y. 1961); *Church* v. *Kinkead Industries, Inc.,* 138 F.Supp. 954 (D.C. Ill. 1955), aff. 234 F.2d 573.

And, on this observation, the Fourth Circuit clearly based its view that it was

> "more reasonable to read claim 1 as describing a forward region that extends *to* just forward of wing panel region of maximum thickness and no farther". (A.30)

The Fourth Circuit then compounded its error by referring to a second, subsequent, research investigation by Dr. Whitcomb, where entirely different wing bodies were tested, which wing bodies happen to extend "64%" of that same distance.[21] Dr. Whitcomb had testified that these subsequent bodies were "*slightly* superior" to the "original bodies" of his first experiment.[22]

But, throughout its reasoning the Court of Appeals completely ignored the actual teaching and disclosure of Dr. Whitcomb's patent specification--which is not limited to the specific bodies of the original research investigation.

To the contrary, the unchallenged, incontrovertible evidence as to the illustrative embodiment of the patent drawing itself showed that in that example of the invention, *14 percent* of the total body length extended forward of the region of maximum thickness (R. 354a).

---

[21] Its erroneous comparison, ignoring the teachings of the patent, also caused the Court to overlook the point that the "percentages" compared (i.e. relating to the distance between the leading edge and the maximum wing thickness) were *themselves not relevant* to the patent and *not* a limitation of any of its claims.

[22] It was from this that the Court of Appeals concluded that a "further forward" closed position was an "improvement" over the patent—ignoring here that the "improved" results were unrelated to the accused airplane, but rather a comparison between two embodiments of the invention of the patent itself.

The comparable figure for the accused Respondent's antishock bodies is an extension of *16 percent* of the total length of the body (R. 354a)—again established by unchallenged, incontrovertible evidence.

Thus, when the accused infringing device is compared *with only the illustrative example* of the patent drawings, there is at most a two percent difference in the forward extension of the body. Translated into actual dimensions on the airplane, this 2 percent difference *amounts to less than 6 inches*—again, an unchallenged, incontrovertible figure.

It will be observed, however, that the Court of Appeals gave greater emphasis to the "four feet forward" position of Respondent's wing bodies (A.30)—but in so doing the Court of Appeals wholly ignored the fact that the wing bodies disclosed and illustrated in the patent specification itself, and clearly covered by the "just forward" recitation in the patent claim, embodied *a comparable extension of over 40 inches forward* of the line of maximum thickness on the wing.[23]

There is seen from these incontrovertible figures the mischief which is wrought when the Fourth Circuit, in this case, departed from the principles of patent interpretation long laid down by this Court, and followed by the other Circuits. The result is a denial of the protection intended to be provided by the patent

---

[23] The trial court, Judge MacKenzie, recognized that claim 1 of the patent specified that it was that *entire portion* of the body defined as the "forward region of a progressively increasing cross-sectional area approximately the same as that of a cone," which the claim places so as to be "extending just forward of the wing panel region of maximum thickness". Literal infringement was thus found by the trial court.

clause of the Constitution,[24] and the intent of Congress in enacting Title 35 United States Code. In this case, an individual inventor, title to his patent having been acknowledged by all proper authorities of the U. S. Government, has seen his invention admittedly pirated by a large, highly patent-conscious corporation; he has seen that invention used exactly in accordance with the teachings of his patent to the great value of that corporation[25]—and has now seen his right to recovery of damages, (as provided in 35 United States Code 284), denied by the Fourth Circuit Court of Appeals; which limited his inventive contribution solely to the scope of his original experiment—while ignoring the broader and more complete disclosure Dr. Whitcomb provided in his patent specification.

Had the specification of the patent in suit been confined to that original disclosure, there might be some rationale from which to say that the inventor's rights were limited to that single embodiment. But, there is no such rationale under the circumstances of this case where, under the classic "contract theory" of patent law, the inventor has clearly made a full and complete disclosure in his patent document—in return for which the law has provided that he is entitled to a commensurate scope of protection for his invention (except, always, to the extent the same might be limited by

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[24] Article I, Section 8: "The Congress shall have power . . . To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

[25] Uncontroverted testimony, indeed admissions in open Court by American Airlines' Vice-President that American Airlines paid General Dynamics an additional sum of $400,000 per airplane for the added speed benefit contributed by the use of Dr. Whitcomb's invention (see FOF's 24, 25, 28-30, at A.11 to A.13), and would not otherwise have bought the airplanes.

prior art).[26] In a decision reported just this week, *Black, Sivalls & Bryson, Inc.* v. *National Tank Co.*, 171 U.S.P.Q. 17 (10 Cir. Aug. 9, 1971), the Tenth Circuit correctly states the accepted principle of law in these words:

> Equivalency must be determined against the context of the patent, the prior art and the particular circumstances of the case and complete identity for every purpose and in every respect is not required. Jones v. Bodaness, supra.
>
> *A primary or pioneer patent,* such as Bender, is to be given *a broad and liberal construction* and, also, a broad and *liberal range of equivalence* and it is *not to be limited to the precise device and instrumentality disclosed.* Mason Corporation v. Halliburton, 10 Cir., 118 F. 2d 729, 49 USPQ 7; Priebe & Sons Co. v. Hunt, 8 Cir., 188 F. 2d 880, 89 USPQ 299, cert. dismissed, 342 U.S. 801, 72 S.Ct. 92, 96 L.Ed. 607. A combination patent which constitutes a marked improvement in the

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[26] Note, here, that Dr. Whitcomb's patent was prepared and prosecuted by patent attorneys of the U.S. Government who had full access to Dr. Whitcomb's work and made full disclosure of his inventive embodiments. While it is true that subsequent to the filing of the patent Dr. Whitcomb conducted further investigations, including the "64 percent" wing bodies revealed to the Court of Appeals, the uncontroverted evidence shows that while those later bodies had certain purely *aerodynamic advantages,* principally resulting from the presence of additional "fillets" in their structure, those bodies were actually "impractical" because of interference by the "fillet" structure with other mechanical operations required on the airplane. The General Dynamics accused antishock bodies in suit *omit* any fillets" from their structure, and are unrelated to Dr. Whitcomb's subsequent research investigation. (R. 358a, 1295a)

art, such as Fearon, is entitled to a substantial range of equivalents.

(171 U.S.P.Q. at 19-20)

The decision of the Fourth Circuit in this case, construing Petitioner's patent so narrowly as not to be infringed by its own illustrative embodiments, is thus also in *direct conflict* with this above decision from the Tenth Circuit.

CONCLUSION

The opinion of the Fourth Circuit below relied on an extract from an 1877 opinion by this Court in *Machine Co.* v. *Murphy*, 97 U.S. 120, at 125 (See A.31) while ignoring that mere "form" is *not* "the essence of the invention" of Dr. Whitcomb's patent, and that, in any event, there was actually no difference in "form and shape", but at most only a slight change in one position of the accused structures. In *Machine Co.* itself, however, infringement, was found on much the same basis as was used in the District Court in this case, this Court then stating:

> *A primary or pioneer patent,* such as Bender, is of a thing, in the sense of the Patent Law, is the same as the thing itself; so that *if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in name, form or shape.*"
>
> (97 U.S. at 126)

Because of the great importance of the Questions presented herein, the widespread interest therein by others, to say nothing of the emasculation which has

been committed on a valid patent for a significant inventive contribution by a renowned scientist, we submit this Court should grant this petition for certiorari.

Respectfully submitted,

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-503

RICHARD T. WHITCOMB,

Petitioner,

v.

GENERAL DYNAMICS CORPORATION and AMERICAN AIRLINES, INC.,

Respondents.

RESPONDENTS' BRIEF IN OPPOSITION TO PETITION FOR WRIT OF CERTIORARI

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November 10, 1971

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There is nothing about these ordinary patent cases which warrants review by this Court.

The decision of the Court of Appeals for the Fourth Circuit, holding petitioner's patent relating to aerodynamic antishock bodies not infringed, is manifestly right. There is no conflict between decisions of Courts of Appeals on the matter. No question of public importance is involved. And there has been no departure from the usual and accepted course of judicial proceedings. In short, there is no special or important reason for granting a writ of certiorari in these cases.

Opinions Below

The opinion of the Court of Appeals for the Fourth Circuit is reported at 443 F. 2d 630. The District Court

for the Eastern District of Virginia did not write an opinion, electing instead to adopt findings of fact and conclusions of law substantially in the form submitted by petitioner. They are reported at F. Supp. ; 164 USPQ 610.

Both the opinion of the Court of Appeals and the findings of fact and conclusions of law of the District Court are printed in petitioner's separate thirty-eight page appendix to the petition.*

Jurisdiction

The jurisdiction requisites are set forth in the petition.

Questions Presented

Petitioner's two "questions presented" are so framed that they create the erroneous impression that in finding petitioner's patent not infringed by respondents' accused devices, the Court of Appeals paid no attention to the claims of the patent in suit.

Question 1 suggests that the Court, without regard for the patent claims, made a finding of non-equivalents even though respondents' accused devices performed substantially the same function, in the same manner and for the same purpose, to achieve substantially the same result as the patented device.

Question 2 states that the Court completely ignored the patent claims, and instead based its finding of non-infringement solely upon a comparison between the accused devices

---

*Cited thus: "(A. 29)" refers to page 29 of the appendix to the petition. "(Whitcomb, 214a)" refers to the testimony of the witness Whitcomb at page 214a in appellant's appendix before the Court of Appeals. Petitioner Whitcomb's exhibits are referred to as "W-" and respondents' exhibits are referred to as "GD-".

and the patentee's research investigations extraneous to the patent in suit.

Even the most casual inspection of the Court of Appeals' Opinion demonstrates that these questions find no premise there. Addressing itself to the infringement question, the very first thing the Court of Appeals said was (A. 29):

> "The issue of infringement turns on the wording of claim 1 of Whitcomb's patent."

Then the Court went on to find non-infringement for the perfectly straightforward and unassailable reason that the accused devices do not correspond to the language of the claims in the patent in suit.

Here there can be no question but that non-infringement was determined by application of the proper and well-established legal standard. The only possible question presented here is whether or not petitioner, defeated below, is entitled in this Court to another hearing on the merits with respect to the non-infringement of his patent. Clearly he is not, *Magnum Co.* v. *Coty*, 262 U. S. 159, 163 (1923):

> "The jurisdiction [to bring up cases by certiorari] was not conferred upon this Court merely to give the defeated party in the Circuit Court of Appeals another hearing."

Statement of the Case

Petitioner's "Statement of the Case" never states the case. It is not until page 19 of his petition that he finally reaches the question of whether or not respondents' accused device is within the claims of the Whitcomb patent in suit. And tucked away on page 24 of petitioner's 28 page petition is the only mention of the dispositive fact that the accused devices are outside the scope of the claims by the

comfortable margin of 4 feet. Some clarification is appropriate.

Whitcomb patent 2,967,030 in suit relates to aerodynamic "antishock bodies", one of a number of different arrangements intended to diminish the adverse effects of an air flow phenomenon known as boundary-layer separation. As an airplane flies, air displaced by its wing flows over the wing's upper surface at speeds relatively faster than the speed of the airplane itself. When the airplane travels at "transonic speeds", i.e., speeds near but below the speed of sound, the air passing over the wing equals or exceeds the speed of sound.

The transition from subsonic to supersonic flow creates a sharp pressure change known as a "shock wave", which in turn causes the air adjacent to the wing to become turbulent and to lift away from the wing, a condition called "boundary-layer separation". The shock wave and its associated boundary-layer separation greatly increase the "drag" imposed on the airplane, and the drag acts as a speed barrier making it impossible to increase the speed of the airplane further without inordinate expenditures of power.

The antishock bodies of the Whitcomb patent in suit, like vortex generators and swept-back wings before them, are intended to control both shock wave and boundary-layer separation so as to delay the onset of drag at high subsonic speeds, and thus enable an airplane equipped with them to reach higher speeds before experiencing a substantial drag rise.* Whitcomb's antishock bodies are

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*Vortex generators (small curved metal veins standing about two inches high on the upper surface of an airplane's wing) and swept-back wings were admitted by Whitcomb to have been "very useful" and widely used to control boundary-layer separation and resultant drag before his alleged invention (Whitcomb, 281a-284a). The Boeing 707, for example, successfully uses both swept-back wings and vortex generators (Whitcomb, 283a).

shown and described in the patent as generally cylindrical bodies, tapering to a point at each end, and mounted on the upper surface of the airplane's wing parallel to the fuselage.

The patent states that the noses of the antishock bodies must be located near or "just ahead of" the region of maximum thickness of the aircraft's wing, and every claim specifies that the antishock body be positioned so that its tapered forward region is extending "just forward" of the wing panel region of maximum thickness (A. 36).

As Whitcomb admitted, the accused antishock bodies on General Dynamics' Convair 990 airplanes* are positioned so that their noses are 4 feet forward of the wing panel region of maximum thickness (Whitcomb, 214a)—forward by over half of the 7.4 foot distance from the point of maximum thickness to the leading edge of the wing (Whitcomb, 192a).

The dispositive question in this case is whether the accused antishock bodies, with noses 4 feet forward of the point of maximum thickness of the wing, infringe patent claims which require that they be "just forward" of that point. The Court of Appeals, answering that question in the negative, held that the claims were not infringed.

After stating that "the issue of infringement turns on the wording of claim 1 of the Whitcomb patent" (A. 29), the Court of Appeals quoted claim 1 in its entirety, underscoring the following phrase which positioned the antishock body's nose as:

> ". . . extending just forward of the wing panel region of maximum thickness . . ."

---

*Each 990 has an inboard and outboard pair of antishock bodies. The inboard pair have their noses well behind the wing panel region of maximum thickness, and accordingly are not accused as infringements (Whitcomb, 294a). This controversy involves only the outboard pair of antishock bodies.

The Court of Appeals then said (A. 29-A. 30):

> "In contrast to the portion of claim 1 emphasized above, the challenged General Dynamics wing bodies extend four feet forward of the region of maximum thickness—53% of the distance from that region to the leading edge of the wing.
>
> ". . . If we are to give any substantive content to the phrase 'just forward' as distinct from any other type of 'forward', it must mean 'slightly forward' or 'barely forward' of the region of maximum thickness. In our view no permissible reading of the phrase 'just forward' can encompass the extension of wing bodies four feet forward; the General Dynamics wing bodies extend too far toward the leading edge of the wing to fit the explicit words of the patent."

On the basis of this "plain and unartificial" (A. 30) reading of the patent claims, the Court held the claims not infringed.*

Having found that the accused antishock bodies were not encompassed by the patent claims, the Court went on to consider whether or not the claims could be stretched by

---

*The District Court's finding of "literal infringement" to which petitioner repeatedly refers (petition, pp. 7-8, 8, 24n) was clearly wrong. Additionally, it was infected by the fact that it was based upon Finding of Fact 32 (114a), as originally entered by the District Court, which stated that the accused antishock bodies were located such that their noses were extending "forward"—not "just forward"—of the wing panel region of maximum thickness.

True or not, this finding of fact had no bearing on whether or not devices with noses "forward" infringe claims which required that the noses extend "just forward". Recognizing the infirmity of original Finding 32 without the word "just" in it, petitioner's counsel contacted the Court's chambers *ex parte* and caused Finding 32 to be altered by the addtion of the word "just" (108a-109a, 117a-118a, 121a).

Finding 32, as thus modified by petitioner's counsel, was found by the Court of Appeals to be clearly erroneous (A. 29).

application of the doctrine of equivalents to include them. It concluded that the claims could not be enlarged by such turning and twisting because (1) the patentee had made the special position of the nose "of the essence of the invention" (A. 31), and (2) the 4 feet forward position was superior in performance to, and thus not in fact equivalent to, the claimed "just forward" nose position.

Reasons for Denying the Writ

1. The Holding of Non-Infringement Below Was Manifestly Correct

Inquiring into the question of infringement in this case, the Court of Appeals compared the language of the patent claims with the allegedly infringing devices. It observed that the claims require the patented antishock bodies to extend "just foward" of the wing panel region of maximum thickness, and found that the allegedly infringing antishock bodies—which extend 4 feet forward—are beyond the scope of the claims. Based on this anlysis, the Court found that there was no infringement of the literal terms of the patent claims.

In thus reasoning, the Court of Appeals was applying the fundamental principle, repeatedly referred to and endorsed by this Court, that the patent claim is the measure of the grant to the patentee, *Paper Bag Patent Case*, 210 U. S. 405, 419 (1908); *Milcor Steel Co.* v. *Fuller Co.*, 316 U. S. 143, 145-6 (1942); *Marconi Wireless Co.* v. *U. S.*, 320 U. S. 1 (1943); *Universal Oil Co.*, v. *Globe Co.*, 322 U. S. 471, 485 (1944):

> "The claim is the measure of the grant. *Smith* v. *Snow*, 294 U. S. 1, 11. The claim is required to be specific for the very purpose of protecting the public against extension of the scope of the patent.

White v. *Dunbar,* 119 U. S. 47, 52; *Minerals Separation* v. *Butte Mining Co.,* 250 U. S. 336, 347; . . ."

Minerals Separation v. *Butte Mining Co.,* 250 U. S. 336, 347 (1919):

> "And of these this court has said in *Keystone Bridge Co.* v. *Phoenix Iron Co.,* 95 U. S. 274, 278:
>
> > 'But the courts have no right to enlarge a patent beyond the scope of its claim as allowed by the Patent Office. . . . As patents are procured *ex parte,* the public is not bound by them, but the patentees are. And the latter cannot show that their invention is broader than the terms of their claim: or, if broader, they must be held to have surrendered the surplus to the public.'
>
> "And in *White* v. *Dunbar,* 119 U. S. 47, 52:
>
> > 'The claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public, as well as an evasion of the law, to construe it in a manner different from the plain import of its terms.' "

The Court of Appeals was also applying settled doctrine when it went on to hold that in the circumstances of this case petitioner was precluded from invoking the doctrine of equivalents to contort the plain language of his claims. Again, the decisions of this Court are clear. A patentee who has made form of the essence (*Winans* v. *Denmead,* 56 U. S. (15 Howard) 330, 342 (1854); *Machine Co.* v. *Murphy,* 97 U. S. (7 Otto) 120, 125 (1877); and *Sanitary Refrig'r Co.* v. *Winters,* 280 U. S. 30, 42 (1929)) cannot later deny that form and shape weigh importantly in the balance when considering the range of equivalents to which his patent may be entitled.

Struggling to avoid the rule of these cases petitioner makes the naked assertion, unsupported by any citation to the record, that form is not of the essence here (petition, p. 27). But it is perfectly clear that the specific location of the patented antishock bodies was of the essence. Indeed, it was the specific location which provided the very basis upon which the Patent Office was persuaded to allow the claims in suit.

The record in this case expunges any doubt that the "invention" of Whitcomb's patent was specially positioning the antishock bodies. Whitcomb's first experiments were conducted with already-existing low-drag wing bodies (Mattson, Tr 688a). With such low-drag wing bodies in the prior art, Whitcomb was hard-pressed to claim any contribution over them. He knew it, so in describing his alleged invention, he claimed that his contribution was only in the "special positioning" of such bodies on the wing.

In the first written disclosure of his idea (GD-1, 703a), Whitcomb said that the "*unique feature* of the present invention is the *special positioning* of added bodies on a wing . . ."* Later testing led Whitcomb to write an amplified disclosure where he wrote (1240a):

> "The noses of the bodies 4 are *just ahead of* the maximum thicknesses 5 of the local [wing] sections . . ."

Again, in this amplified disclosure, which precisely located the noses of the antishock bodies, Whitcomb noted that "The *unique feature* of the present invention is the *special positioning* of a group of small added bodies on a wing" (1241a). When his patent application was given to him for review before filing, Whitcomb himself changed it to fix the position of the nose of the antishock bodies as "just

*Emphasis ours throughout.

ahead of" the maximum thickness of the wing section (W-108, 1245a).

Whitcomb's change was carried forward into the patent (A. 35) in col. 1, ll. 36-38. Elsewhere in the patent it is likewise made clear that "The noses 4 of the bodies 1 are near or just ahead of the local wing sections" (A. 35, col. 2, ll. 31-32).

As originally filed, Whitcomb's patent application included claims broad enough to encompass an antishock body located anywhere on the wing (GD-6, 759a). In the face of prior art cited by the Examiner, Whitcomb cancelled all broad claims from his patent application (GD-6, 765a). Thereafter, the claims which issued as the patent claims in suit (760a) all contained the "just forward" limitation. In arguing for the allowance of claims thus limited, Whitcomb urged the specific positioning as critically important.

He acknowledged that a cited Northrop patent showed elongate bodies on the upper wing surface, but pointed out (GD-6, 771a):

> "[T]here is no teaching in this reference that the noses of these components extend *just forward* of the maximum cross section wing panel region . . ."

He then went on to distinguish the Northrop reference on the basis of "these positively recited limitations" (771a).

On familiar principles of file wrapper estoppel Whitcomb's abandonment of broad claims and acceptance of only narrow claims limited to specific positions, coupled with his arguments to the Patent Office urging that specific positions were the basis for patentability, prohibit him from now urging successfully that his claims include devices not so positioned, *I. T. S. Co.* v. *Essex Co.*, 272 U. S. 429, 443, 444 (1926); *Smith* v. *Magic City Club*, 282 U. S. 784, 789-90 (1931); *Exhibit Supply Co.* v. *Ace Corp.*, 315 U. S. 126,

136-137 (1942); and *Graham* v. *John Deere Co.*, 383 U. S. 1, 33 (1966):

> "Claims as allowed must be read and interpreted with reference to rejected ones and to the state of the prior art; and claims that have been narrowed in order to obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent. *Powers-Kennedy Co.* v. *Concrete Co.*, 282 U. S. 175, 185-186 (1930); *Schriber Co.* v. *Cleveland Trust Co.*, 311 U. S. 211, 220-221 (1940)."

All of Whitcomb's writings to which reference has just been made—and his patent and its Patent Office history as well—establish that Whitcomb viewed the "just forward" position as of paramount importance. The Patent Office allowed the claims in suit on the basis of limitations to the "just forward" position. These facts make it plain that form, and the "just forward" location, are of the essence in Whitcomb's alleged invention.

With specific location so clearly established as critical and with Whitcomb unable to point to a single fact or circumstance which suggests that it was not, the Court of Appeals was entirely correct in concluding, on the basis of the controlling decisions in this Court, that "this is a case where form and shape are of the essence of the invention" and a case in which "differences in form and shape may weigh importantly in the balance" (A. 31).

These considerations buttress the holding of noninfringement which flows inevitably from the fundamental fact that the claims in suit do not read upon the allegedly infringing antishock bodies.

Casting about to create an aura of public importance which might induce this Court to review this case, petitioner attempts to conjure up a conflict between the decision here and decisions of other Courts of Appeals. The petition goes on at inordinate length (petition, pp. 11-18) citing decisions in this Court and of Courts of Appeals, which say a device that follows the teaching of a patent cannot avoid infringement of that patent simply because it improves or adds to the effectiveness of the patented structure.

We have no quarrel with the rule, and the decision of the Court of Appeals here in no way conflicts with it. The Court of Appeals here compared the language of the patent claims in suit with the allegedly infringing structure, found they did not correspond, and therefore found non-infringement. This straightforward determination is in no way inconsistent with the rule that an accused device which falls within the claims of a patent may still be an infringement even though it might contribute some improvement over the patented device.

It is true that the 4 feet forward position which is specifically excluded from the claims is superior to the "just forward" position required by them. Whitcomb himself acknowledged the superiority of the far forward position (Whitcomb, 323a, 358a, 865a). But this is simply evidence of the very real difference between the "just forward" position required by the claims, and the superior and non-infringing 4 feet forward position of the accused devices.*

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*Petitioner contends (petition, pp. 3, 22) that the Court of Appeals' conclusion regarding the superiority of the accused devices was arrived at by erroneously comparing the accused devices with experimental research investigations of the patentee, instead of comparing the accused devices with the patent claims. The Court's opinion makes clear that it made the correct comparison (A. 31):

> ". . . wing bodies similar to the outboard bodies on the *General Dynamics planes* deal more successfully with the boundary layer separation problem than bodies fitting the precise description of *Whitcomb's claim 1*."

The Court of Appeals referred to it (A. 31) as evidence of this difference and as nothing more.

Finally, petitioner contends (petition, pp. 20-24) that the Court of Appeals' decision construes the Whitcomb patent so narrowly as to exclude its own illustrative embodiments. This tortured argument is based upon measurements Whitcomb himself made on Fig. 2 of the patent drawings (A. 33), after he had selected where he wanted to put the point of maximum wing thickness in that drawing (Whitcomb, 354a). A glance of Fig. 2 reveals that in that drawing one could arbitrarily put the wing's point of maximum thickness anywhere he wanted it to assure his desired result. Furthermore it is well-settled that patent drawings do not even purport to be scale drawings, *Otto* v. *Koppers Company,* 246 F. 2d 789, 797 (4 Cir. 1957):

> ". . . the proportions shown in the diagrammatic drawings [patent drawings] are not critical and they do not purport to be scale or working drawings."

Petitioner's self-serving measurements made from a non-scale drawing can have no force in the face of the repeated statements in his patent and elsewhere, *supra,* pp. 9-11, to the effect that the noses of his antishock bodies must be "just forward" of the wing panel region of maximum thickness, and to the effect that the "just forward" location is critical.

2. There Is No Conflict of Decisions and No Question of Public Importance Is Presented

No other suit has been brought on the Whitcomb patent. Thus, there is no decision on the same matter in conflict with the decision of the Court of Appeals for the Fourth Circuit, here sought to be reviewed.

This case is nothing more than a private patent controversy. No domestic airplane other than the Convair

990 ever used antishock bodies, and the 990 was a widely publicized financial failure (GD-39, 912a). The Whitcomb patent is plainly not a patent of unusual public importance. Apposite here is the rule stated in *Keller* v. *Adams-Campbell Co.*, 264 U. S. 314, 319 (1924):

> ". . . Such an ordinary patent case with the usual issues of invention, breadth of claims and non-infringement, this Court will not bring here by certiorari unless it be necessary to reconcile decisions of the Circuit Court of Appeals on the same patent."

The record here does not present any substantial question of Federal law requiring resolution by this Court. The finding below of non-infringement is fully supported by the facts which make clear that the accused antishock bodies are beyond the scope of the patent claims, and it is perfectly in accord with the decisions of this Court.

Conclusion

The petition should be denied.

Respectively submitted,

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November 10, 1971

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-503

RICHARD T. WHITCOMB, *Petitioner,*

v.

GENERAL DYNAMICS CORPORATION AND AMERICAN AIRLINES, INC., *Respondents.*

PETITIONER'S REPLY TO RESPONDENT'S OPPOSITION

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November 16, 1971

PRESS OF BYRON S. ADAMS PRINTING, INC., WASHINGTON, D. C.

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PETITIONER'S REPLY TO RESPONDENT'S OPPOSITION

Respondent's opposition says no more than what respondents ordinarily say—viz, this is an unimportant case of no general public interest because it is only a quarrel between private parties.

Such could also have been stated in:

Graham v. *John Deare Co.*, 383 U.S. 1 (1966)
Graver Tank & Mfg. Co. v. *Linde*, 335 U.S. 605 (1950)
United States v. *Adams*, 383 U.S. 39 (1966)
Sanitary Refrigerator v. *Winters*, 280 U.S. 30 (1929)

Temco Electric v. *Apco,* 275 U.S. 331 (1928)
Anderson's Black Rock v. *Pavement,* 396 U.S. 57 (1969)

While each of those cases involved a private quarrel between the litigants, as does this case, underlying that quarrel was a *legal issue* of great and *general* public importance. In each case certiorari was accordingly granted—granted, in fact, only two years ago *on the very question here presented,* in *Standard Industries* v. *Tigrett Industries,* 396 U.S. 885 (1969), see Petition page 3,—for the same compelling reasons as exist in this case for granting the writ.

Otherwise, Respondent merely proceeds to distort the holdings below and of the conflicting decisions by contending that

(1) the Court below did *not* hold non-infringement because of a supposed superior performance; and,

(2) the holdings of the conflicting Courts merely related to improvement devices falling within the literal scope of claims of a patent.

Not so on both points.

The Fourth Circuit below expressly stated it held non-infringement,

> "Because this is a case where . . . [the] alteration does add to the effectiveness of the device . . ." (A. 31)

Further, in the conflicting decisions of six other Circuits (Petition pages 12-18), the issues involved "improved" devices *outside* the *technical* language of the claims—but as to which each of those other cir-

cuits stated, *as has this Court,* that infringement under the Doctrine of Equivalents is *not* avoided merely because the alteration in an otherwise infringing device makes some improvement in its effectiveness for achieving the *same* function and purpose of the patent.

Respondent does not answer, and obviously has no answer to, that clear conflict.

Respondent also leaves unchallenged the fact that there is an *actual* difference of at most only 2%, a matter of about six inches, between forward extensions of the accused bodies and the bodies described in the patent (see Petition pages 23-24). These facts were established by clear *and unchallenged* testimony in open Court, but *ignored* by the Fourth Circuit below when it failed to read the patent claims in light of the patent specification. Respondent's only argument is to cite *Otto* v. *Koppers* (Opposition Brief, page 13) and to point out that the patent drawings in *that* case were shown *not* to be "scale" drawings and could thereby be ignored. No such evidence exists in the instant case.

There was no basis for the Fourth Circuit below to strip the "just forward" language of Whitcomb's patent of its intended meaning, and then completely re-word the claim to read "barely forward". The law has always held that a patentee "may be his own lexicographer and we add, his own grammarian", *Chicago Steel Foundry Co.* v. *Burnside Steel Foundry Co.,* 132 F.2d 812, 814 (7 Cir. 1943), and that his claims are to be construed with that in mind, so as to "*of course* read upon the [patentee's own] specification", *Reiner* v. *I. Leon Co.,* 285 F.2d 501, 504 (2 Cir. 1960).

This, the Fourth Circuit below did not do in this case.*

Petitioner again respectfully submits this Court should resolve the conflict between the circuits (as it had hoped to do in *Standard Industries*).

The instant case presents a particularly meritorious vehicle for it to do so.

Respectfully submitted,

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* Other points in Respondent's Opposition were thoroughly discredited below, including its allegation of an "*ex parte*" alteration of the Court's Finding 32 (when actually Judge MacKenzie himself authorized correction of a secretary's error in copying what were wholly *inter partes* papers); and its resurrected, but wholly unfounded, contention of file wrapper estoppel—an artificial issue confected solely out of a carefully-edited partial-sentence quotation.